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VACATION TIME — SUMMER-SCHOOL TIME

The time is near at hand when teachers begin to lay plans for their vacation program. For an ever-increasing number of shop teachers, vacation time is summer-school time, and it speaks well for the teachers of industrial arts and vocational education that so many of them take this method of improving themselves professionally.

To help those who are looking about for a suitable institution to spend their vacation time this year, attention is here called to the following teacher-training institutions whose statements of summer-school offerings have appeared in the advertising sections of the last few issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

Bradley Polytechnic Institute, Peoria, Ill.
Carnegie Institute of Technology, Schenley Park, Pittsburgh, Pa.
Kansas State Teachers College, Pittsburg, Kans.
Oregon State College, Corvallis, Oreg.
Pennsylvania State College, State College, Pa.
Stout Institute, Menomonie, Wis.
University of Minnesota, Minneapolis, Minn.
Wayne University, Detroit, Mich.

OF SPECIAL INTEREST

The reader's attention is especially called to the following articles which appear in this issue: Education for the 85 Per Cent, by J. W. Studebaker; Purposeful Experiences for Beginners in Drawing, by Lawrence F. Ashley; Teaching Methods Which Increase Industrial-Arts Achievements, by Robert E. Smith; School Hobby Shows, by Joel F. Maurer, and Miniature Rooms, by A. G. Pelikan.

While each of the other articles appearing in this issue carries its own particular message, those mentioned will have special appeal at this time.

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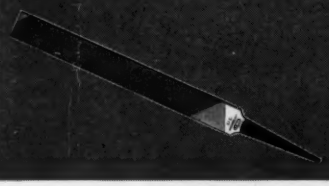

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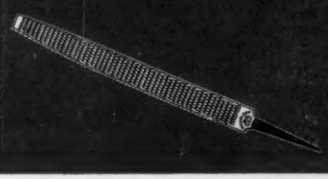

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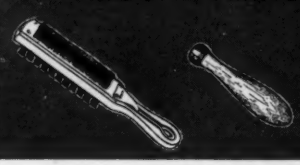

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May, 1938
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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Purposeful Experiences for Beginners in Drawing

Lawrence F. Ashley

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A record of day-to-day procedures, and a question-answer discussion.

Various so-called methods in teaching, such as the "project method" and the object method did much to create a need for industrial activities in order to furnish experiences which would give meaning to what had been abstractions in formal schooling. That these methods could be applied in the teaching of activities has been overlooked to the extent that many of them are as formal and abstract as Euclid ever was. For example, many high schools have a course which they term "mechanical drawing" in which students are required to copy from a text, for the most part, geometrical figures which have no meaning and little other value than a purely disciplinary one. The idea of "purposeful effort" is completely lost sight of in the belief that the purely "learning by doing" kind of task obviates any special method. Mechanical drawing especially has fallen into bad repute because the teacher too often has been a slave to his texts and losing sight of child nature, has taught by the A, B, C method — lines, angles, circles, etc. The high-school boy "hates" the drawing period and consequently does very poorly with his plates.

Since various types of widely publicized methods fail to show the step-by-step, day-to-day routine of starting and carrying forward a class, the very thing above all else that the teacher needs in order to correct the attitude toward drawing, an experiment in purposeful teaching, is now recorded.[1]

The First Day

Each student took a place of his own choice in the room. Introductory remarks were made by the instructor suggesting purposes of the work which the students would undertake. These remarks ran something like this:

You have gathered here this morning presumably to learn mechanical drawing, for that is what your course seems to be called. However, our real purpose shall be to further your greatest interests at the present time and make use of a new method of expressing them which we may designate as a universal language. This language is simply a graphic representation of your ideas and it can be understood by the Japanese, the Chinese, the Germans — in fact, all nationalities. In order to use this language, you shall be lent certain apparatus which will be yours for the term to care for and to use in any way that you like, provided that you do not damage it and are able to return it to us at the end of the course in good condition. Now, if you were free to do exactly as you would like to do for the next six weeks, or perhaps months or years, having the money you need and no restrictions whatever, what would be your greatest desire? What would you like to do above all other things? Think carefully and write this down on the piece of paper which we shall give you and sign your name to it. It shall be our purpose to comply with your wishes by helping you with your plans.

The students were then handed sheets of paper on which they wrote according to directions. These interests were expressed as follows:

Vernell McInturff: "I like cars."
Warren Nixon: "I am interested in automobiles."
Miles Tipsword: "I am most interested in printing and journalism."
Ronald King: "I would like to travel."
Gene Anderson: "I am mostly interested in traveling in an automobile and visiting interesting parts of the world."
Tony Johns: "I would like to fly an airplane."
Owen Harlan: "I am interested in touring the country and seeing all the great things such as Yellowstone National Park and the Grand Canyon."
Lowell Stanley Davis: "I would like to travel in the West and see the western country."
Robert L. Easton: "I'm interested in electricity and television, also aviation."
Charles Lowell Bower: "I am interested in airplanes and electricity or motors."
Billy Kellam: "I am most interested in aviation and drawing"
Allen Monts: "I like airplanes."
Wallace Wilson: "I like aviation."

Interest Areas. The students were thus grouped in the following interest areas: Travel, printing, aviation, automotives, electricity. Now began the task of getting each started in drawing, using his major interest as the point of departure. In order to have something for each to do while the instructor was busy with one of these groups, some statements were made regarding the manner in which the drawing paper would be fastened to the boards, and it was suggested that each student get some paper and mount it on his board, and make light margin lines one inch from the edges, using the T square, triangles, and pencil. The instructor suggested that each group make an effort to find information about his particular interest to bring to the class at its next meeting. Suggestions were made for beginnings which seemed to be fitting from the pupil's point of view.

The Travel Group. Upon talking with those interested in travel, it developed that only one had been any great distance from his home. Most of them wanted to tour the West. Some maps and bulletins[2] which described the important parks and other points of interest were obtained and a preliminary study of these aroused further interest and pointed to specific plans to be made. One boy, after seeing a beautifully colored map of Little America and the South Pole insisted that he should like to journey there.

The construction of strip maps was decided upon as a good beginning project to teach the use of the scale, dividers, triangles, and T square. The first maps were drawn upon scrap paper one half the size of the finished map to give practice in the use of the scale. The distance of

[1] An actual experiment. The class met five days a week for an hour a day. Procedures are summarized for the first six weeks.

[2] These maps and bulletins may be obtained free from the Department of the Interior, National Park Service.

the route which was to be traveled was measured with the dividers and important cities were indicated. The entire distance was then computed to a scale which would fit the strip map. The distance between important cities or towns along the route were then indicated on the strip map in relation to the scale. Practice in lettering was obtained in citing various places along the way.

Several problems were encountered while computing the distance of each boy's journey by the use of dividers and the scale of miles on the map. One problem was in finding a scale for each strip map. Since no two boys were taking the same trip, individual scales had to be found. This was done by taking the entire mileage of the route to be traveled and dividing it by the length of the strips. For example, if the distance was 2,000 miles and the total length of each strip was 40 inches, 2,000 divided by 40 gives a scale of one inch to 50 miles.

Another problem arose when the map was transferred to the drawing paper. The first maps were made half the size of the final form, and accuracy was required in measuring relative distances. If a mistake had been made on the trial map in using the half-inch scale, it would be detected when the one-inch scale was used. Such errors due to inaccuracy in measuring from a single point in one town to a single point in another town were found in three maps. The correction of this error proved to be a lesson on the necessity of accurate measurement. Further exercises in lettering and making arrowheads were attained in the transfer.

The Aviation Group. Considerable material proved to be available in the library, not only for the maps but pertaining to the interests of the other students as well.[3] Most of the first week was occupied in discussions leading up to the decision of the kind of work students would care to pursue and what would be the initial plan to make. The group in aviation decided they would begin by planning an airport. Two of this group wanted to plan an airport for the city of Charleston. A government bulletin furnished much of the data needed in laying out the plan and a great deal of interest and initiative was shown by the boys undertaking this problem. They visited the site and considered the locality chosen in a professional manner. Arrangement was made in connection with the planning of the airport that the students who wished to do so could build a model based on their own plans, in their shop class which immediately followed the drawing period. This proved to be an added incentive. It was remarkable to see the amount of knowledge that the boys had and how soon they acquired additional information.

Ideas for the second and third problems evolved naturally from the airport planning. For example, two boys were very eager to plan the construction of an airplane; while a third boy wanted to work on the electrical circuits for the plane. Two of the boys secured a motor and wanted to plan a plane body for it. They were at once confronted with numerous problems relative to the mounting and wiring of it.

Automobiles. The group interested in automobiles began working on designs of different body lines. Their purpose was to discover the wind resistance of different shapes of cars. They designed four little models of cars and made plans for building an apparatus to test wind resistance, after they had finished their model car designs.

Each day a few minutes were allowed for questions after which a demonstration of general interest usually about conventional methods in planning (drawing) but of short duration was given by the instructor. Students were asked to participate in the demonstration as far as possible. Interest was kept at a fever pitch all the time. This was seen in the fact that when nearly three weeks of the term had passed, there was not a single absence or tardiness, and an additional student transferred to the group.

Electrical Interests. Lowell Bowers and Robert Easton were interested in motors and electrical hookups respectively. Robert looked in books for illustrations of apparatus "hookups" to find those that are common in the home, and his instructor guided him in deciding what to plan first. Lowell began by studying a small model of a motor. Its operation was explained and his enthusiasm grew when he was told he would be able to make the motor in his shop class. He immediately wanted to make the working drawings, and was referred to his reference text for conventions. He began sketching the three views of the motor. In less than three days, he had completed them to scale and was ready to transfer them to his drawing plate. The convention of hidden lines bothered him at first, but after two or three mistakes, he was able to represent them properly. Another point that troubled him was visualizing the side view of a cylinder as a rectangle. However, viewing a cylinder at eye level soon cleared up this difficulty. Lowell seemed to understand easily how to do three-view work.

Robert began drawing a light operated by two switches at various points. He drew it as it looks when in use, and represented it by symbols. He worked diligently at his task and did considerable research and sketching prior to putting the work down on the plate.

Printing. Miles Tipsword was the only one in the group interested in printing but seemed inspired from a story of early printing. After considerable discussion, he was permitted to make a study and begin plans for a model of the Gutenberg press. He brought to class a large amount of outside material to aid him in his work. A picture gave one dimension and from this he determined a scale and made measurements for the rest of the press. As fast as he planned parts he made them in his general shop class. The finished model was a success. He drew well and his work in drawing threads was exceptionally good. He was now ready to ink his first plate.

Two weeks were thus taken in the orientation of interests and in the study of procedures and conventions, largely self-initiated. The boys made a very good beginning and advanced at a good rate of speed. At the beginning of each period such demonstrations and lectures were given by the teacher on the use of apparatus, sharpening of pencils, lettering, making of arrowheads, types of lines, etc., as need for them arose.

The Third Week

The first part of the period on the first day was spent in discussing the work that had been done thus far in the course. On the second day, a few minutes were spent in discussing the work of the five groups. A member from each group was asked to give a brief summary of his work and plans for procedure. The purpose of this was to give each group an idea of what was going on in class, as they were more or less ignorant of what was being done by the other groups. This would also furnish them with new incentives and possibly lead to work in some other field should they discover more than one special interest.

Some of the boys were ready to do drawing with more than one view about the middle of the week. The instructor now gave a rather detailed discussion of orthographic projection and the spacing of three views. On Thursday, a few review questions were asked about the use of the scale, since the group working in the field of electricity was needing it.

By Friday, four boys wanted to ink, therefore it seemed best to satisfy their curiosity, by a discussion on inking. The instructor explained the use of the ruling pens and compasses, the filling and adjusting of the pens, cleaning of the pen, and

[3]See bibliography or reference list at the end of this paper.

some of the rules of inking. He also explained that much drawing in industry was not inked. The remainder of the periods were spent in working on their plates.

The groups made rather rapid progress, judging by the intricacies which they were able to master, and continued with a high degree of interest.

The Fourth Week

The first day of the week the class was asked to pass about the room and look at the work of the other groups and to note anything they wished to have discussed. This gave each member of the class a clearer conception of the work of each pupil. A few questions were discussed by the various groups and a short review of some points taken up the third week followed.

On the second day, the teacher mentioned the fact that orthographic projection had been discussed but there were a few points upon which they could elaborate. During the exercise, three boys were asked to go to the blackboard and make a sketch of the front, top, and end views of an object before them. At the next meeting of the class the topic of discussion was dimensioning. Some illustrations were placed on the board and the teacher read some rules of dimensioning to the class.

On Thursday, a discussion and illustration of how to make numbers and letters in the universal language of drawing was taken up by the instructor. The pupil's pride was appealed to in referring to the method as "the conventions used by master engineers." The last day of the week, the teacher took up the rules to follow in inking a drawing. The rules were put on the board and were to be copied on a small piece of paper by the students. This small piece of paper was to be fastened on some corner of the drawing board. The instructor made clear that it was not necessary to ink their plates as commercial industries do not require much inking. He told them they could ink their plates if they wanted to do it for the practice or to enhance the appearance of the drawing.

The pupils working in the field of aviation had each practically completed a plate in airport designing. Three members of the group had their drawing almost inked. The fourth member of the group, who was the new member in the class, had his plate almost done in pencil. He had started a miniature airport in his woodworking class. The boys had some difficulty in finding a scale with which they could show the lights.

The instructor checked off on a chart the various learning units in drawing through which the different problems had taken the students.

The Fifth Week

The procedure of the previous weeks continued. At the beginning of the period on Monday, some questions concerning lettering were discussed. A short conference was then called with individual groups. The purpose was to find out what the students had planned for their next plate.

The group interested in aviation decided to continue work on airport design and construction. One of the boys wanted to make a drawing showing the various circuits used in wiring the airport he designed in plate one. The other three boys were all interested in making a three-view drawing of a hangar. Two members of the group working in the field of aviation had completed their first plates. The others were nearly done with this plate also.

On Tuesday, there was no lecture or demonstration, but a few questions for information were asked by the students. After they had been properly explained, the class continued work.

The discussion on Wednesday was on the use of lower-case letters, and the teacher told the class that he would place the alphabet on the board. The pupils were asked to copy them for practice and future use as there was no complete alphabet in their text. The instructor told them that it was important to be able to make good letters for a good drawing is spoiled by poor lettering. The question was asked "What is meant by the word *case* in speaking of lower-case letters?" One of the students explained that the word had been derived from a form of printer's case in which the capital letters were located above and the others in the lower part of the case.

The students began work at the very beginning of the period Friday, as there was no lecture or demonstration given by the teacher. The teacher gave each member of the class a booklet that he had been given by some company. The other two plates on airport design were handed in. Work had begun on the second plate, a three-view drawing of a hangar.

The Sixth Week

The instructor began the period Monday complimenting the students on the type of work they had been doing. He told the students that their work had been receiving favorable comment from the advanced students in both high school and college. Then the teacher told them how they could improve their plates by doing certain operations in inking. He also gave a demonstration before the class so the students could see the value of the points explained.

On Wednesday, he explained the use and purpose of the progress chart which was now exciting the curiosity of the class. It was explained that as certain exercises were performed, they were checked off on the chart to the credit of each.

During the period Thursday, the instructor told the class how to make several useful conventions and devices. He explained how to make a thumbtack lifter from a coffee-can key. He also told them how to make a pen filler to fit in the cork of their ink bottles, how to fix the lettering pen to hold more ink, and several other things that could easily be made to aid in drawing.

Friday, a demonstration was given on the use of the irregular curve and compasses. He showed them how certain lines and curves could be made. Members of the class continued interest in their work. They had also shown great improvement in their drawing technique and had speeded up considerably.

The members of the group in the field of aviation had completed their second plates, as had most of those in the other areas. They were able to do them in about one third the time required for the other plates. Three of the group planned to make a drawing of an airplane. The fourth in the group was going to make a drawing showing the necessary wiring for an airport. A few things of interest are: One boy said he had a dream about an airplane and thought he could draw one; another statement by a student of the group was the following, "I like this stuff." Many similar statements were made each day which showed that the students were fascinated by their work. The exercises that the students had completed were checked to their credit on the progress chart.

The screw threads required by the printing press and the automobile-body designs excited general interest.

Discussion

Question: "Do you call this teaching mechanical drawing?"

Answer: "No, I am dealing with youngsters whose age level is too low for trade training to be effective. I prefer to call it planning."

Question: "Why have them try to draw these ridiculous things which are just fancies or whims? Why not do something useful?"

Answer: "The teen-age boy lives in a world of fancy or whim, and consequently to him they are realities of supervalue. How senseless to have him draw lines, angles, and circles in which no one has any interest, when he can get the same practice in planning the thing in which he is at the moment absorbed."

Question: "Won't the student waste a great deal of time in looking up materials and studying about his plan before he begins drawing?"

Answer: "No. On the contrary, he gains time! It is true that he is not using all of his time in manipulating instruments, paper, and ink, but he has been exploring new worlds — acquiring a wealth of information and a social attitude of even greater importance. Draw-

ing, the ostensible reason for the class congregating, is the means by which new fields are opened and is also the first step in an interesting project."

Question: "Do you mean to imply that you would not require a set number of plates for a term's work?"

Answer: "Plates are not the objective. Certain learning units are, of course, kept in mind by the instructor, who so guides the planning that they are involved."

Question: "Why did you have them ink their drawings when this is becoming less and less an industrial requirement?"

Answer: "Again I must remind you this is not a class in trade training. The pupils wanted to ink because they saw how much nicer the plates appeared when inked. A question of the aesthetic was involved and from this point of view, as well as the fact that the inking idea originated with the students, it was wise to ink even though some plates might be spoiled."

Question: "At what age would you introduce *mechanical drawing* as such?"

Answer: "I take it you mean trade training in drafting by the line-angle-circle-solid-projection method. I believe that the individual with a low I.Q. will probably do drafting of a kind by this method, but I question the method even for adults with normal or high I.Q. For example, I knew a man who learned the essentials of drafting by drawing the parts and the assembly of a Model T Ford timer, a thing he needed to know in detail as he was a garage mechanic."

Question: "Where do texts come in when you teach by the pupil-interest method?"

Answer: "Good texts anticipate the problems and carry the answers. They should be at hand for general reference."

Question: "Can this method of teaching drawing be used in general-shop situations?"

Answer: "Certainly. The planning area in the general shop is an essential feature. It differs from the setup described, only in the fact that the mechanical areas in which the plans are to be executed in materials are at hand. Planning is carried on just a little ahead of execution and students move readily from the planning area to the woods or other areas."

Question: "What is your candid opinion about the pupil-interest method versus the logical method? Aren't you just rationalizing in favor of an experiment?"

Answer: "It is not an experiment. I have only proved for drawing what the early Egyptians advocated in teaching arithmetic. I observed that another meaningless abstraction (mechanical drawing) had been beheaded and an otherwise listless class of boys had been transformed into an alert, happy, fascinated group."

Question: "Isn't it harder for the teacher to look after such diversified interests without a good deal of lost time and confusion?"

Answer: "True, the teacher does need to be more alert. With a little guiding, the interests of a group of thirty boys can be found in not to exceed a half-dozen areas. The joy of working with a happy interested group compared with a noninterested mischievous group alone offsets the extra effort. The pleasure of feeling that you are doing the psychologically sensible thing is the greatest satisfaction. Real pupil gains are obvious."

Question: "Just what was accomplished by the members of the drawing class? What tangible evidence have you for your work?"

Answer: "Each boy has not only constructed several drawings of unusual interest to him but several drawings with very creditable technique from the industrial angle. He has also further proof of values attained in the completed project made from the drawing though this need not have been a necessary part of the program. Further evidence of values can be seen in the student's answers to questions about the problem on which he worked."

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Studying the crystalline structure of metal with a photo-micrographic camera. Brooklyn Technical High School, Brooklyn, N. Y. — Photo by Keystone View Co.

Education for the 85 per cent

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The value of industrial arts and vocational education from the broad educational viewpoint. Address at the American Vocational Association Convention, Baltimore, Maryland, December 2, 1937.

The American Vocational Association is interested in the proper vocational education of all young people. For years your Association has prompted the cause of vocational education; that is, the kind of education that equips a young person to be sufficiently competent in some field of service to enable him to make an honest living and to be self-reliant and self-respecting. There is no doubt that American organized education throughout its entire history has given inadequate recognition to vocational education. In most communities provision for vocational education is still inadequate.

Furthermore, with the passing of time and the development of a more and more mechanized industry, vocational education is necessary for an increasingly large percentage of young people. Since 1890 the gross population of this country has increased from 63,000,000 to 128,000,000, or 105 per cent. But in the same period the secondary-school enrollment increased from 203,000 to more than 6,000,000, or 2,855 per cent. In 1890 the relatively few secondary-school students, following academic courses, were preparing to enter college where they would, in turn, pursue additional academic courses as a basis for professional careers. Now the secondary school, a truly democratic institution, enrolling millions of young people representing a full cross section of our entire population has the same responsibility to start its students on the way toward their careers, but for many millions of those enrolled these careers are not the professions. The fundamental purpose of organized education is the same today as it was a half century ago; namely, to accelerate through systematically planned experiences, the rate at which learners might otherwise gain understanding and develop competence for practical action. Throughout the past decades the need was for a flexible adaptation of this basic purpose to the widely diversified range of human service demanded by the growing complexity of modern society.

Using a hoe is a much simpler vocational activity than driving a tractor. Swinging a scythe is a very different operation from handling a reaper. Writing sales items in a daybook is not much like keeping the accounts of a great business organization. Pumping a handcar down the railroad track is a different type of job from manipulating a gasoline engine on the same car. The responsibility of the mother and the homemaker in the crude homes of an isolated and ever-expanding frontier was not what it is today with the accumulated available knowledge of child care, of foods, of science, and of art. Everywhere in industry operations with complicated machinery are taking the place of simple hand operations, and the burden of understanding the intricacies of life in the home, in business, and on the farm is growing greater.

Purpose of Development

Vocational education is being developed in an effort to meet the increasing demand for thoroughly and broadly trained workers. The campaigns based on this demand have been and are still being carried on with great vigor. Those engaged in these campaigns have sometimes been led by their enthusiasm to stress the needs for such training even to the point where their arguments appeared to discount the values of general education, so called. Those seeking a modernization of education were aware that the secondary schools of this country were catering largely to young people who were planning to enter college. The secondary schools in general were not keenly interested in preparing young people for the skilled trades and for other nonprofessional occupations. It was necessary to campaign for vocational education in order to break down the apathy among the secondary schools and to bring the country as a whole to a realization of the urgent need of better vocational education.

It was natural, therefore, that these early, zealous advocates of vocational education should have seemed to discount the values of general education. But even to the present time we still need evangelism for the cause of vocational education.

The time has come in the campaign, however, when the best interests of vocational education itself will be served by a better integration of vocational education into the whole program of education. It seems to me that the special proponents of vocational education must now undertake, in spite of their legitimate zeal, to see more clearly the whole educational process and to fit vocational education into its proper place in that process.

In Line with Modern Curriculum Policies

The suggestion that vocational education should be fitted into a unified scheme of total education is in line with modern proposals for receiving the school curriculum. Educational leaders who are giving special attention to the study of activities that should be included in the school program are pointing to the need for a functional program of instruction that will be based upon large areas of life activities rather than upon highly separated subject-matter courses. These large areas, of which an important one should be vocational life, would constitute the core of the curriculum in which the present school subjects would be merged and integrated in the educational experiences included for student activities. Vocational education lends itself most appropriately to such a curriculum treatment. It would be a most important core area in a curriculum built upon fundamental human desires and activities. It would form an important segment of the educational program for the 85 per cent of our people who work.

In fitting vocational education into its proper place in the unified scheme of total education there should be mutual benefits for both vocational education and so-called general education. On the one hand vocational education provides the materials and methods to enrich and vitalize general education. On the other hand vocational education would be strengthened by the modifications in general education which are bound to follow this suggested integration. Let me illustrate both of these points.

Many principles in education, though fundamental, are of such long standing that we tend to forget them. They are, nevertheless, basic to all educational procedures. One such principle concerns the relation of interest to learning. There is little or no mental growth except where the learner is actuated by a genuine interest. What the truly educative process requires is activity motivated by the interest of the learner. This interest may

be natural or it may be acquired, but in either case it must be genuine. From studies of the nature of children and adolescents, it has become clear that with large numbers of them it is practically impossible to develop a genuine interest in the more strictly academic or abstract phases of subject matter. These children and young people are not dullards. They are likely to be among the thoroughly worth-while members of adult society when they are grown. The simple fact is that their minds function largely in connection with the manipulative processes in which they are enabled to engage. They can understand in terms of things they can touch and see and hear. They cannot understand so well things which are developed merely out of abstract verbal definitions or descriptions. For this type of learner even the mastery of reading, writing, and arithmetic, as well as the comprehension of the essentials of geography, history, and literature call for the development of a curriculum rich in materials which can be handled and seen and heard as well as talked about. This type of material we have usually associated with the industrial arts, and we have learned how to enrich curriculums with projects involving the making of things and the dramatic episodes growing out of the making of things.

A curriculum activity should include educational situations that are real to the pupil, ones which come within *his* experiences in life and are, therefore, meaningful to him, and which afford adequate and proper opportunities for *self-expression*. The practical arts square with such a requirement for the reasons that: (*a*) They use as medium for instruction the material things, thereby providing a contrast — and a desirable and interesting one for the 85 per cent who work — with the medium of abstract symbols used for much of the instruction in the academic subjects. (*b*) They provide opportunities for self-expression in types of activities in which boys and girls have natural interests. Opportunities for self-expression are a touchstone for the value of any curriculum activity.

Applies to Vocational Education

If this idea is carried further, it will be seen that in principle it applies also to vocational education. In the life of each child there comes a time when the manipulative impulse which made industrial arts interesting and educationally valuable gives way to an impulse to work with tools and processes involved in making a living. When that time comes the same fundamental interests which made basket weaving educationally valuable make raising prize corn valuable or taking apart and reassembling a carburetor a valuable educational activity. The youth has now reached the age when he is stimulated primarily by the reality and the social significance of the thing he is studying as against the stimulation which came earlier from merely satisfying the manipulative impulses which he so strongly felt.

Therefore, vocational education when properly conceived has a very direct relation to general education. It provides the basis upon which many young people must build their personality development. This is only another way of saying that vocational education rightly conceived is rich in its significance for general education. Young people, particularly the less abstract-minded ones, will develop culturally from vocational studies rightly used, better than they will from the more abstract studies.

This may sound like heresy to those who assume an aristocratic pride in linking the development of culture directly and exclusively to what they vaguely call "general education." But in our search, even for the best pabulum for what is called a "liberal education," we should not forget the most fundamental human traits and tendencies.

It can be said of vocational education and of practical arts that they are among the earliest human activities that differentiate man from the lower animals. Motivating forces behind the development of these human interests as a part of education, have always been (*a*) the original tendency of man to manipulate material things and (*b*) his purposive and very natural attempts to find satisfiers to certain human wants such as those associated with food, clothing, shelter, and transportation. The natural tendencies to manipulate materials and to love the beautiful, when combined with efforts to satisfy wants for material products, have resulted in a modification of the physical world in which man lives and consequently changed life experiences and created new social patterns of behavior. No other physical activities in life have been more potent factors than these in determining the direction of human thought. They consequently constitute an essential area in the activities for the general education of all, and they have significant implications for the special education of the 85 per cent who work.

But let us dissect this process called cultural education more carefully to see what its essential purposes are and then ask by what educational means these purposes may be attained.

Social Progress

Probably first and foremost in the process of cultural education we would expect to see developed an understanding of one's responsibility for social well-being; that is, one needs to have some conception of what constitutes social progress. That is little else than a comprehension of the factors which are at work in society upon which each individual may expect to exert some influence. Certainly such comprehension cannot be sufficiently developed in most young people except through their contact with the realities of the workaday world around them. A controlling philosophy of life for a young person cannot be gained from listening to or reading high-sounding precepts, lectures, and sermons until his *experience* in life's actualities is rich enough so that generalizations can have some real meaning. Experience with life's actualities is the very essence of vocational education.

The second most essential aspect of culture is the possession by the individual of sufficient information, social experience, and aesthetic appreciation to enable him to bring his own judgments and decisions in line with social demands, to cause him to possess broad human sympathies — the milk of human kindness. To produce such attributes cannot be thought of as a process of memorizing. Memorized facts do not come sufficiently to the aid of a person driven by impulse and emotion to do something he ought not to do. Feeling is a vital factor in determining action, and feeling is developed out of practical experiences more than out of information. At any rate, information must be supported by experience. Thus again we see the need of contact with reality in order to achieve the second aspect of culture. Contact with reality is the essential attribute of vocational education.

The third most important aspect of culture is the possession of initiative by each individual. Persons of culture must be disposed to act upon impulses rather than merely to possess ideals about which they do nothing. Lives of action are important not only to the individual but to society itself, particularly to a democratic society. The "let-George-do-it" attitude is the bane of democratic countries today.

Contacts with Realities

How can initiative be developed as effectively by any other process as by the richest possible contacts with realities? In these contacts one is having to do something about each situation as it arises thoughout the entire experience. It is not the same as merely reading about issues. One may develop by his reading an attitude toward one line of action or another and that is important. But the habit *of doing something about it* is also important and is entirely different from a mere attitude. This habit of doing something is

likely to result from dealing with actual situations. Here again vocational education by its very nature is rich in actualities.

Finally, the fourth attribute of culture may be dignified by so high sounding a word as intellectuality. This means that one becomes aware of the processes involved in solving problems. It means that one learns to measure the pros against the cons; to weigh evidence; to assume responsibility for deciding upon the validity of a proposal. The amount of money lost on sheer quackery and fakes in this country every year is enormous and these losses are by no means confined to the so-called ignorant classes. People who have gone far in what we sometimes label the cultural studies are victimized apparently quite as readily as are others.

But a little thought will disclose the fact that this trait of weighing the pros and cons is exercised most effectively when one is confronted with real situations. The vocational student has to make innumerable choices the results of which he sees and learns to test. Almost every decision in connection with doing something is a decision calling for the exercise of this important ability to use judgment, to weigh evidence. Thus a sound and broad program of vocational education may make its contribution to that aspect of general culture called intellectuality.

From the analysis I have given it would appear that the activities, the contacts with real-life situations involved in vocational education, may well aid in accomplishing the purposes of cultural education. This might appear on the surface as claiming that vocational education is the whole of education because through it there may be developed not only the vocational skills needed for making a living but also the attributes of mind which are regarded as the outcomes of general education. (To a degree that would be a fair interpretation of the situation.) Every civilization has had a dominant element. In Greece the dominant element was art and language. In these activities the Athenian citizen worked assiduously. In Rome the dominant element was law and government, and the free Roman citizen perfected himself in these social activities. The dominant element in our civilization is industry, in which the machine is conspicuous. Industry and the machine are largely determining our social order. No one can claim to be cultured in his civilization who neglects to study the dominant element, with its resulting social pattern. Insights, attitudes, and forms of behavior that may be realized through proper provisions for vocational education and the practical arts are essential not only for gainful employment but for a claim to culture.

Let us now look at the other side of the picture in order that the real significance of an integrated program may be apparent in which vocational education plays its rightful part. To accomplish the purposes I have mentioned, vocational education cannot be taught in isolation from general education. If the student is to see in the problems of the automobile mechanic the place of the worker in the social scheme; if he is to acquire through his work with the automobile a proper part of the information, social experience and aesthetic appreciation necessary for wise decisions; if initiative is to be developed; and most difficult of all, if intellectuality or the capacity to make judgments and the habit of weighing evidence are to come from work with an automobile, such work must be planned as an *educational*, not as a mere training procedure. Merely to stand over a youth and tell him what to do in taking a carburetor apart and what to do in putting it together again will produce almost none of the general education outcomes described in the foregoing. Assuming, however, a youth's genuine interest in the problem of what makes a gasoline engine go, there is almost no limit to the extent of critical reading, calculating, and questioning that can be planned around that genuine interest.

A Question of Purpose

It is essentially a question of the purpose in the mind of the vocational teacher. If he is interested only in developing the skills called for in a given occupational task, he will organize his course to train for those skills in the best habit-forming ways. He will produce a workman who can perform routine jobs skillfully upon machines which he has been taught to handle. He will not prepare the workman to understand a new kind of machine when it appears on the market or to use unfamiliar tools when they become available for his shop. He will be as guilty of routinizing education as are some of the teachers of academic subjects who seek only the development of skills without much understanding. The teacher of vocations in schools should not be interested alone in making a skilled routine mechanic as important as that is. Industry can do that. The teacher's job is to make an intelligent workman. Such an education applies not to the relatively few who now take vocational education but to the 85 per cent of people who work.

What I have said should make clear that in my opinion, general education cannot really achieve its purposes until it is permeated with a spirit of genuineness and reality in its relation to life situations. Studying about something must be supplemented by the means of working with that something wherever possible. The compelling interest in preparing oneself to earn a living should be utilized far more widely than it is. The English teachers should use it; the social-science teachers should use it; the chemistry teachers should use it. The whole secondary-school faculty in a measure should become vocational teachers. Likewise, the members of the vocational-education staff should comprehend their function as teachers of general education.

One Educational Program

There are not two kinds of education applicable to most secondary-school students. There is *an* educational program needed by the 85 per cent, not two programs. That program should rest upon all those interests which stir the lives of adolescents. That program should recognize that among those interests none is more dominant than fitting oneself for earning a living.

But it should be equally recognized that there is no clear and complete demarcation between the interest in earning a living and the other interests of the adolescent youth. His interest in his health, in being popular, in mating, in facts about plant life, about animal life, and about the workings of man's mind; these and other interests, integrated with those connected with making a living, should be the basis of a unified course of study. We need not less vocational education for the few, but more vocational education for the 85 per cent.

I realize that unless wisely managed this attempt to operate an integrated secondary-school program may mean merely to motivate general education through the students' interests in vocational subjects. Of course, that must be avoided. *Vocational education must not be spoiled. Its fundamental purpose, which is to prepare young people to earn a living, must not be thwarted.* On the other hand, it must be clear that vocational teachers are interested in seeing to it that workers possess wide social interests. Therefore, insofar as it can legitimately be done, vocational education, as well as industrial arts, may properly help to motivate an all-round general education.

Three Important Implications

The implications which follow from this proposal are many. I shall confine my comments to three of them.

First, vocational teachers in such an integrated secondary-school program should possess, in addition to occupational competency, a broad general education. Vocational teachers must be prepared to see vocational courses in their manifold relationships with all other courses. Instead

of an isolated subject, agriculture, for example, should be intimately associated with science, with history, with economics, with art, etc. The teachers of these subjects and the teachers of agriculture need to work together to plan courses which have the highest cultural values because motivated by interests in the challenging realities found in agriculture.

Second, since vocational purposes and motives should permeate widely throughout the curriculum, far greater vocational-education facilities than at present will have to be provided. Experience with plants, livestock, machinery, household equipment, and the like, should be available not only for the few who may be planning definitely on farming as a means of livelihood. For those who have made farming their vocational choice, for example, there will be certain skills established which, perhaps, may be inappropriate for others, but for the whole 85 per cent there is need for an integrated course vitalized by the contacts with reality which vocational education provides.

Third, since the virtue of vocational education as a motivating force in general education is the fact that it provides real-life situations with which students can deal, it follows that the nearer the vocational course can approach actual occupational conditions the better. This means that more of education will be found in the surrounding community and less in the schoolhouse. It means that industrial, commercial, and agricultural leaders and homemakers will have to recognize that they owe a certain obligation to the rising generation. In a sense, these community leaders must become teachers; their plants, schoolhouses. The "no trespass" signs must come down so far as students are concerned. The whole community must become the educational laboratory for the youth of the country.

It is not inconceivable that industries should set aside space where operations of the sorts valuable for education would be provided. These operations would be kept constantly up to date and would be managed by the schools strictly for educational purposes. When an education program for the 85 per cent is devised and a community takes seriously its job of vitalizing that education, it will be clear that everyone should co-operate in it. When secondary schools really start in earnest to educate all the young people instead of carrying out programs designed for the relatively select few, fundamental changes must come about in the relation between the school and the community. Life for most young people today has been robbed of many contacts with interesting activities and with work, by the industrial and commercial developments of the past few decades. These significant educative contacts must be restored by the co-operation of school and community.

A Prophecy

Probably what I have said is enough to give you a sketch of the meaning which lies behind education for the 85 per cent. If I am right in my prophecy, the vocational teachers must come into a more important place in education than ever before. They will be essential factors in bringing the community and the school together. They must bring all the people to understand the educational significance of working with something real. An activity which lacks the motive of interest is likely to be barren of educational results. Vocational education, broadly conceived, supplies that motive in the case of a large percentage of our young people. Professional workers in that field have a very great responsibility resting upon their shoulders. I know that they will carry it with credit to themselves and to the Nation.

Industrial-Arts Laboratory Planning—III

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Safety, and general considerations to be taken into account when planning, are the topics treated in this, the third of a series of articles.

Safety

The problem of safety is likewise one which has caught the American people unawares. The people have rushed headlong after the almighty dollar and have not thought of the danger to humanity because of the increasing mechanization of many phases of human existence.

We know very little, for instance, about the specific causes of accidents in industrial-arts laboratories. We know very little about devices and ways of arranging machinery so that the greatest safety will result. However, the American public is aroused as never before, and no doubt many industrial-arts teachers will be instrumental in helping to solve the problem. The problem of safety presents a good illustration of one which really requires some sort of group attack.

If a uniform accident report blank were available for all industrial-arts shops of the land, and if each teacher would report the exact cause and nature of accidents, it would not be long before all could proceed more intelligently. As it is now, each teacher, so to speak, "must go it blind."

There are all sorts of revolving pulleys, gears, shafts, arbors, belts, and the like, which must be carefully guarded. Anything which revolves and which is not smooth may produce an accident.

A great deal of effort has been put forth to improve guards for machinery, but it is often difficult to get teachers and pupils to use the guards which are provided. This may be largely due to the fact that sufficient study has not been given to the devising of guards which, while in place, will allow the carrying on of the full range of activities which the machine can handle.

There have been several instances of accidents caused by obstructions on the floor, or because levers and sharp corners project beyond machines.

Some teachers have advocated that dangerous machines have a safety zone around them and that this zone be marked by a painted line which can be seen easily. Their argument is that this will make pupils more cautious and that since only one worker is allowed within a danger zone at a time, that fewer accidents would result. Whether or not this is actually true is not known. Research alone will give the answer.

It is believed that machines should be separately fused, separately switched, and that it be possible to lock the machines, individually and collectively so that they cannot be used while the instructor is absent from the laboratory. Some instructors have advocated that signs be used on the walls of the shop, warning the pupils of the dangerous character of the machines. It is believed by many that these only tend to create fear in the pupils. Some also have the belief that fewer accidents would result if children were in-

structed in the safe use of machines rather than by attempting to set up a fear complex in them.

When machines are installed, one should be very certain that they operate at the speed recommended by the manufacturer. It is a well-known fact that emery wheels wear down. In order to secure proper cutting speed after this has occurred, industrial-arts teachers have them put on a smaller pulley to step up the speed. Later on, when the small wheel is replaced by one of larger diameter, it is easy to forget that the speed must again be decreased. The high speed then subjects the wheel to undue strains, causing them to break, and probably cause fatal accidents.

Just as far as possible, floors around machines should be nonskid. Hard maple floors especially are slippery. To overcome this condition some industrial-arts teachers apply varnish to the floor around a dangerous machine and then sprinkle it with fine sand while the varnish is still "wet."

In planning a laboratory, one should make it just as easy as possible for human nature to observe safety precautions. Goggles should be placed near where they are to be used. Fire extinguishers should be near doors as well as in far corners of rooms where fire may break out. A first-aid cabinet should be available. It also should be placed near an exit.

All switches to machines should be safe so that there is no danger of a person's getting an electric shock. These switches should be within reach of the person as he stands at the machine in normal operating position.

All power tools should be grounded so as to avoid static electricity, and also to decrease the likelihood of shock to the worker in case of a *short*.

Large stores of inflammable materials should not be kept near where they are actually used. The containers for daily use should be small so that in case a fire does break out, there will be but a small amount of combustible material where the fire originates.

All main doors to the laboratory should swing out, and they should swing toward the nearest exit.

One should be especially careful in locating equipment near entrances. The writer knows of one laboratory, for instance, where a power hack saw is located just inside the door to the machine shop. Whenever long material is being cut, it projects across the passageway. Persons entering or leaving the room during the process of cutting, are likely to stumble over the stock.

Just as far as possible, machines should be arranged for maximum safety. Table saws, for instance, should be arranged so that small pieces of wood will not be thrown in the direction where pupils are working, or where they pass. Frequently equipment is so arranged in laboratories that there is no aisle. Arrangements of this kind should be avoided.

The main entrance to a shop should be from a hallway, or from the outside of the building, rather than through some room.

So far as possible, all corners and projections should be avoided. Most people do not realize how many accidents are caused by some of the very common things like steps, corners, posts, projecting bolts, projecting setscrews, and things of that type.

General

Frequently industrial-arts laboratories are arranged as if the work was not thought of as a unit. The drawing rooms, for instance, are in one wing or on one floor of a building, and the shop or shops are located in a different portion of a building, or they may even be distributed over three or more floors of the building. It needs little argument to convince the thoughtful person that this condition is not what it should be.

Not only should the industrial-arts rooms be adjacent to, or near one another so as to avoid unnecessary steps, but it would be well if provision were made to permit interdepartmental relationships. In a good school system, the art department, the industrial-arts department, and the journalism department ought to bear close relationship one to the other. Especially is this true if a printshop is a part of the industrial-arts setup. These three departments ought, therefore, be located as near together as possible.

All this illustrates the point that the work of laboratory planning is a fairly complex one, and that the person who does the planning should have the objectives of the whole school system in mind and should be able to view educational work in an integrated fashion.

The question as to how much space should be allowed for each pupil in the laboratory has not been scientifically determined. Certain sections of the United States allow considerably more area per pupil than other sections. Certain laboratories, such as drawing, can get along with much less space than, say, auto-mechanics shops. About the least space that can be allowed is thirty square feet per pupil in drawing rooms. This really makes things rather crowded. In other laboratories, the allowance often runs up as high as one hundred square feet per pupil. Whenever one adds special rooms of any kind, he can be assured that the number of square feet per pupil will be increased.

With smaller laboratories, one must allow more space than in a larger one where many more pupils are accommodated. For most work, industrial-arts teachers should do their best to get along with not more than sixty square feet per pupil.

In many cities, the school administrators keep an account of the per-pupil-hour costs for each of the subjects and for each of the rooms. All space used is thus accounted for, and it is a wise idea to not be wasteful of the taxpayers' money no matter how much space one is able to get.

Just as far as possible, all parts of the laboratories should be visible to the teacher from any point in the laboratory. If there are auxiliary rooms, such as blueprinting or wood-finishing rooms, it is desirable to have a part of the partition glass.

When one is locating the industrial-arts teacher's desk, it is a good thing not to get too far away from the entrance to the laboratory. Principals, and others, who want to see the teacher can thus do so with the least amount of travel. Also, when classes pass, the teacher can be near the door to note those who come in and those who go out. Many industrial-arts teachers, of course, spend practically no time at their desks. We suspect this to be true of the best teachers. The desk, itself, however, is usually the center of conference with co-workers and superiors when they do come into the laboratory.

Whenever possible the lockers for the pupils' work should be located in the shop. In one industrial-arts laboratory that the writer is familiar with, the pupils store their work in an overhead attic. They must go up a narrow stairway at the beginning and at the close of each period. It is impossible for the teacher to be both up in the attic and downstairs at the same time, and naturally much mischief takes place unseen by the teacher.

The key cabinet, if one is used, should be located somewhere near the entrance; yet it should not be in a corner or recess where congestion is likely to result.

In all laboratories, we should think of the sequential order in which machines and certain pieces of equipment are going to be used. One industrial-arts laboratory, in which woodwork is taught, is located in a long room, approximately 120 feet long. The woodworking benches are in one end of this laboratory, while the oilstones are kept in the far end. This makes it necessary for each boy to travel approximately 90 feet to sharpen his plane iron.

Blackboards and bulletin boards should be placed so that the pupil can see them without glare. If possible bulletin boards should be artificially lighted.

In very few schools does one find that forethought has been given to the question of a showcase for the industrial-arts depart-

ment. According to Warner,[1] a display case is very desirable for selling the industrial-arts program in the school to others. He writes as follows:

"The provision for a museum, show case, or display place seems to hold increasing importance for industrial-arts settings. One shop teacher reports some 8,000 pupils to have seen his lighted showcase, even in a basement corridor, over a period of one week. The building of showcases in principal corridor walls seems to be more desirable, at least from the angle of merchandising one's shop program, than placing them inside the shoproom. The showcase should be equipped with vertical rows instead of horizontal showcase lights. This provides for a maximum of visibility. The back walls are best made of cork linoleum and the shelves of plate glass supported by movable brackets."

I have noticed two schools where the showcases were electrically lighted, and in which the lights were controlled by an "electric eye." That is, the case was illuminated only when someone stepped in front of the case. This not only conserves electric current, but also makes an extremely attractive showcase. Whether or not such attraction would continue to exist after the novelty of the mechanism wears off remains to be seen.

Just as far as possible, we should have industrial-arts laboratories on one floor of a building. Where part of the laboratory is in the balcony, it means that both teacher and pupils must do much stair climbing. Stairs are not only hard on one's energy, but they are also dangerous, and one should not use them any more than necessary.

At times industrial-arts laboratories are used as passageways to other rooms. This means, for instance, that the drawing student enters the industrial-arts laboratory at one end and passes through it into the drawing room. This results in a lot of unnecessary confusion in the laboratory.

Tools and tool panels should be so placed in the laboratory that a minimum of travel is required by the pupil. If so much as two minutes of time can be saved for each pupil in beginning work and in putting it away, there will result quite a worth-while saving.

One seldom finds an industrial-arts laboratory where adequate storage is provided. Especially is this true if several types of activity are taken up in the same laboratory at different times during the year. One really needs a separate room with many shelves and cases. In some cases, the storage room is located on a floor beneath the laboratory. This is better than nothing, but it would be much better if the room were adjacent to the laboratory and on the same floor level. When making provisions for storing supplies, remember to provide space large enough to accommodate standard-sized material.

A person seldom finds an industrial-arts teacher who isn't carrying from a dozen to twenty keys. There is no excuse for this if one makes provision ahead of time to have all locks master-keyed, sub-master-keyed, and grand-master-keyed. Locks so keyed are but slightly more expensive to begin with, and they do make it more convenient for all parties concerned. Of course, there is no known locking system that anyone has yet discovered which is both convenient for many persons and at the same time possesses maximum security. The old adage, "Beware of the door which has many keys," is still quite true. In case one has a room in which many valuable tools are kept, he had better not have the lock of the master-key variety. Cylinder locks, of course, are more secure than tumbler or warded locks.

In locating machines provisions should be made, insofar as possible, to provide for accommodation of maximum-sized material. For instance, if lumber is bought in 16-ft. lengths, the circular saw should have 16 feet of clearance between it and the wall or nearest obstacle. Some teachers use the device of placing a saw so that a window can be opened when material of unusual length is used, thus enabling one to take care of the unusual situation.

Just as far as possible, the items of similar equipment should be arranged so as to be convenient to all workers. For instance, if a whole class is to use 16 soldering furnaces, it would be well not to have the furnaces all on one bench. On the other hand, one does not want to get them scattered all over the shop. This would make the instructor's work more difficult.

Large amounts of lumber, supplies, and materials should not be openly accessible to pupils. Many have found, for instance, that no matter how many boards there are in a pile of lumber, a boy always thinks that the bottom one is best. Also, if a half-dozen cans of the same kind of filler are placed in the finishing room, it will soon be discovered that each of the cans has been opened, although the contents of not one of them has been used completely. This makes for an unnecessary waste of material.

Industrial-arts laboratories have in many cases been located in basements or even in sub-basements. Architects have recently found, however, that it costs less to put a building above ground level than to excavate and make basement room. Therefore, there is some hope for the future. Basement rooms are damp and cause tools and machines to rust. They are undesirable from several other angles also.

Any room which contains small tools of considerable value should either not have windows, or else the windows should be barred.

Machines requiring a similar type of instruction should be grouped together. Also, machines requiring similar types of accessories could well be grouped in adjacent areas. This enables the teacher to be available to a group of similarly interested pupils with the least amount of confusion to the rest of the class.

In case any units are included in the shop which are naturally dirty, such as foundry work, pottery work, or cement work, it would be well to place these farthest from the entrance to the laboratory so that the dirt will not be tracked to other parts of the school building. Just as far as possible, one should equip the room so that the pupils have least cause to leave the room while the class is in session. Drinking fountains and washbasins should be available without leaving the laboratory.

Just as far as possible, one should also have telephone facilities so that the teacher does not need to leave the room. A buzzer system and clock system should be available for the industrial-arts laboratory as well as for the other rooms in the school.

A useful alphabet for the drafting room by W. Ben. Hunt, Hales Corners, Wis.

[1] Warner, William E., "Studies in School Shop Planning," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, p. 31, February, 1934.

Teaching Methods Which Increase Industrial-Arts Achievements

Robert E. Smith

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Making industrial-arts work function more efficiently in the life of the student.

During the past two years, the writer has had opportunity to visit 28 schools in 9 cities, each having a population of over 200,000, and 59 schools in small cities and rural communities located in 8 states.

In visiting these schools, two things were strikingly noticeable. First, the broader offering of industrial arts found in all of the larger cities visited and in most of the small cities. About one fourth of the schools in the small cities and approximately two thirds of those in rural communities were offering woodworking and drawing with a considerable portion offering woodworking only. The second outstanding feature was the emphasis on objectives. Not once was a teacher asked if he had objectives — assertions in the affirmative were voluntary in many instances. When such were not forthcoming voluntarily, the question "What are you trying to teach these people?" usually resulted in a statement of objectives. The objectives cited covered a wide range of those commonly appearing in the literature. These represent the formulations of many of the outstanding members of the profession. In addition to the features mentioned, a third of the teachers expressed the thought that individualized instruction should receive attention. Individualized instruction in varying degree was observed in all schools. Perhaps too much credit should not be given teachers of industrial arts for instituting this device, since the nature of the subject and the environment in which it is taught is such as to practically compel employment of the method of individualized instruction.

Objectives Cited

Most of those visited cited exploratory experiences as their principal objective. Other objectives frequently mentioned were development of consumer knowledges and appreciations, development of technical or industrial understanding, development of esthetic appreciations, development of a number of elementary skills in the activities offered, and development of avocational interests. A number gave development of desirable social traits and habits as a principal objective. A few gave this as their most outstanding objective. When asked to be more specific with respect to this objective, the reply most frequently given was — development of a co-operative spirit, initiative, self-reliance, self-confidence, and resourcefulness.

Providing a broader offering and having definite goals represents advances in the field. Whether or not these advances are real or hypothetical is another question and is a challenge to which all education has been subjected. Much has been made of the point that adding to the offering is a means of providing for individual differences and interests. Such an assumption is probably as indefensible as when similar claims are made for a curriculum that has been broadened by the mere addition of subjects. Claims that addition of subjects in a given area provide for individual differences and interests unless accompanied by a change in method of teaching traditionally used, are in no respect more valid than claims that equalization of funds provides all children with equal educational opportunities. All that such funds provide is buildings, traditionally equipped, open for a certain number of days or months per year with a teacher of some sort in charge. Equalization funds do not guarantee or always provide a teacher of ability, nor do they guarantee or provide a differentiation of curriculums compatible with the abilities, interests, or desires of pupils. These cannot be achieved by merely providing facilities, for achievement involves a differentiation in method just as does teaching of industrial arts if that subject is to contribute maximally to the educative process.

Achievement of Goals or Objectives

Unquestionably objectives are essential in education as elsewhere; for example, in ordinary life. One marked difference, however, is observable in the two situations. In ordinary living there is often concerted effort toward achievement, while in education the reverse too frequently is the case. The writer makes no defense of the objectives previously stated, other than to point out that they are among those commonly found in the professional literature and that he is willing to accept them as expressions of purposes which each instructor presumably can defend as contributing to the educational purposes of his particular school. Evidence that purposes are being achieved frequently is not apparent upon casual observation and the seeker must resort to other means. In this case observation was supplemented by conversations with respective teachers and pupils.

Explorational Objective. Evidence that the exploratory objective was being achieved in considerable measure was observable in the fact that a fairly wide range of activities was being carried on in such areas of the industrial arts as metalworking and woodworking. Very little work in electricity, in any of its phases, was seen. Drawing was found in approximately 70 per cent of the schools, but with few exceptions, only a narrow range of instrumental drawing was observed. Five schools did offer a course in architectural drawing and three a course in commercial art or postermaking. The exploratory experiences provided were, in every case, of the manipulative type. Not one case of the investigative type was observed. Furthermore, casual inquiry here and there was as unproductive of evidence as were observations. This does not mean that exploratory experiences were not offered at some time in these classes, nor are the conclusions warranted, that experiences of this type were not provided or encouraged. Nevertheless, in view of the absence of observable evidence, one is inclined to question that the explorational objective is stressed.

Achievement of the Manipulative Objective. In each school there was unmistakable evidence that manipulative skills in varying degree both in quantity and quality were being acquired. This is a worthy achievement particularly as it affects the development of desirable individual, personal, and social behavior.

Achievement of Esthetic Appreciation. This was an objective frequently mentioned, but one where little evidence was found that it was being achieved. True, many pupils were observed making

articles of wood and metal that had balance, symmetry, pleasing proportions, a pleasing combination of straight lines and curves, and good form, but observation or inquiry revealed that in most cases the pupil was using a drawing prepared by the teacher or working designs taken, original form, from books. There may, at some time, have been study of examples of good design, but no evidence of this was observed. In the classes, only isolated cases were seen where the pupil was attempting any kind of original work which incorporated accepted principles of design. Such cases as were observed were found in advanced high-school classes, where the work was elective, in each case.

Consumer Knowledges and Appreciations. This objective was almost as frequently mentioned as the exploratory objective. The development of such knowledges and appreciations generally is thought to be associated with the informative and investigative approach to industrial arts and perhaps rightly so. However, one should not overlook the fact that in the manipulative processes one learns much about the physical characteristics of materials and of the importance of substantial construction and honest workmanship. This is particularly true if one's attention is directed toward these factors. Just what emphasis was being given to the informative and investigative approach is difficult to say, because, even though a great majority of the teachers involved gave development of consumer knowledges and appreciations as an objective, not a single lecture, discussion, or investigative activity was observed. True, a large number of demonstrations and discussions pertaining to the activity were in evidence, but in every instance these had to do with a manipulative process. The fact that no lectures or class discussions centering about the informative aspect were observed does not warrant the assumption that none of this was being done in industrial arts in the schools visited. Yet, if much emphasis was being given that aspect of the subject, certainly one would expect to meet with it at some time even in casual visits. Inquiry among pupils revealed little. An occasional pupil said lectures were sometimes given, but not one reported that class discussions were held or reports given or requested. Nor were any found who reported library work as a part of their work in industrial arts.

Development of Avocational Interests. Achievement of this objective is difficult to determine because specific evidence is not likely to be found in the classroom. The most that one can safely say in this respect is that provision of opportunities in a number of exploratory experiences probably is a positive factor in stimulating such interests.

Development of Desirable Personal Social Traits and Attitudes. This is increasingly becoming recognized as an important objective of all education, including industrial arts. Despite this fact, few gave it as one of their objectives. This may have been because of its acceptance as an objective of general education. A considerable number of the teachers visited stated they were trying to develop certain specific elements in the category of personal social traits and attitudes, for example, initiative, self-reliance, co-operativeness, and dependability. With respect to achievement, a large number, approximately 50 per cent of the schools in the large cities and about 30 per cent of those in smaller communities, had some form of personnel organization in operation. This provided occasion for co-operative association with the various members of the class. Office held in the personnel organization gave occasion for the exercise of some initiative, some opportunity to exercise self-reliance, and to display a measure of dependability. Procedures of this nature are commendable but to stop with these in a situation satiated with opportunities does not seem justifiable.

Methods of Instruction

In most of the schools visited, both class and individualized instruction was found. Not a single instance of group instruction on less than a class basis was observed. Inattention was in evidence while group instruction was being given. This, of course, one would expect because in many cases both interest and readiness were lacking. Class instruction commonly was supplemented by individualized instruction to the limit of the instructor's ability to reach the individual members of the class. Only two cases were observed where the teacher maintained a central station requiring the pupils to bring their problems to him.

The method of pupil self-instruction was used to a very limited extent. In fact, employment of this method was frequently impossible because of the absence of source materials — books, magazines, pamphlets, charts, models, or other devices. Failure to provide such teaching devices seems to be a widespread weakness of industrial-arts teaching. Further evidence of this is seen in the findings of a survey of reference material for industrial arts in 34 Ohio rural and small-town schools. These findings reveal that 16 of the schools mentioned had no books in the library or shop on industrial arts, 15 had from 1 to 30 with an average of 13.2, 2 had 50 books each, and 1 had 75. In contrast, 14 schools offering vocational agriculture were found to have an average of 44.2 books per school, although these schools had a much smaller enrollment.

This overview of conditions as they were observed, showed much that is commendable, but also some outstanding shortcomings. The latter, as the writer sees it, have to do principally with outcomes and methods of teaching. For purposes of discussion, outcomes from industrial-arts teaching may be thought of as falling in two large categories; namely, acquisition of certain knowledges and skills, development of certain appreciations, and development of individual behavior patterns. The term *behavior patterns* here implies those patterns that individual pupils develop on the basis of a philosophy of life which they can support and which is the cumulation of the interplay of experience, thought, and judgment on their parts, with thoughtful consideration of their individual and social responsibilities in the social order.

The acquisition of knowledges and skills presents no peculiarly difficult problems, and it is the writer's conviction that such as may be involved will evaporate in a teaching situation favorable to the development of socially wholesome and effective individual personal behavior patterns. As the writer sees it, elements in such behavior patterns would be development of, in keeping with individual potentialities, a habit of thoughtful consideration for the personal rights, interests, feelings, and ideas of others, a functioning sense of one's individual responsibilities to the social order, a habit of self-reliance, a co-operative spirit with respect to associates, capacity for self-direction, resourcefulness, perseverance, initiative, adaptability, exercise of judgment, and an analytical approach to problem situations. These, of course, are elements common to the educative process in general, but they have peculiar implications in industrial arts because of favorable environmental conditions and the many opportunities for specific application to concrete problems or situations.

Suggested Procedures

The development of behavior patterns such as those cited, cannot be achieved in a vacuum or by mere suggestion. Achievement will be had only as a result of consistent practice in and application to each and every situation where the respective elements have bearing. Taking these elements of behavior and citing specific applications should give some idea of how the ends desired may be accomplished.

A Habit of Thoughtful Consideration for the Personal Rights, Interests, Feel-

ings, and Ideas of Others. There are many opportunities for the practice of this quality in the industrial arts. For instance, in the associative use of tools and equipment; in the selection of stock; in refraining from ridicule of an associate's undertaking which, on the surface, may appear childish; and in being willing to courteously consider and evaluate the ideas of another. To achieve the desired end the teacher will need consistently to encourage manifestations which are positive, and by example, put into practice that which he advocates.

A Functioning Sense of One's Individual Responsibilities to the Social Order. Many opportunities present themselves in an industrial setting favorable to the development of this attribute. For instance, responsibilities with respect to assumed or assigned duties or obligations; responsibilities with respect to the use and care of tools and stock; the practice of safe procedures in the use of tools and equipment; the personal and social responsibility one has for the industrious application of one's talents to the solution of a problem; and the social responsibility one has for consistently putting forth one's best efforts to do work of high quality, regardless of its nature. The teacher's problem here is to so direct the learning situation that the student will be conscious of responsibilities and so that he will have occasion and opportunity to make applications of them.

A Habit of Self-Reliance. One of the most outstanding features of the student-teacher relationships observed in the classes visited was the seemingly complete dependence of the pupil upon the teacher in supplying needed information. A considerable number of teachers when appealed to, made an effort to get the pupil to think through his problem or answer his own question. A much larger number, however, supplied the information without making any attempt to get the student to rely on his own ingenuity or effort. During these student-teacher interviews, it frequently occurred to the writer that here was a splendid opportunity to take a first step in teaching the student to rely upon himself by referring him to a source or sources; for example, books or magazines. The teacher who consistently refuses to supply information until after the student has himself made a reasonable effort at discovery is not only doing a better job of teaching than one who supplies the information upon request, but also is taking a first step in developing selfreliance in that student.

Further achievement in this respect may be had by providing opportunity for students to select and plan their own work. Frequently merely providing the opportunity will suffice. This usually is true with the brighter and more aggressive pupils. Those, and there will be many, who do not voluntarily take the initiative, should be required to assume greater and greater responsibility in this respect — of course, always in keeping with their potentialities. The foregoing procedures will aid in developing ability to cope with unfamiliar situations. Pupils also should be encouraged to make oral reports before the group. This will aid them in developing ability to maintain poise and self-assurance under trying conditions.

A Co-operative Spirit. The nature of the subject and the environment in which industrial arts is taught lend themselves to some development of this attribute without much effort on the part of the teacher. A much more significant development can be had by a teacher who directs attention to the many possible aspects of co-operative behavior, who creates or encourages situations requiring co-operative effort, and who himself, consistently sets an example of co-operativeness.

Capacity for Self-Direction. As industrial arts is commonly taught, it is doubtful that much is achieved in this direction. If progress is to be made, pupils must be provided with opportunity and occasion to assume responsibility for the initiation of their own activities, for planning and developing these activities, and for securing desired or necessary information. Further, they must be encouraged to persevere, regardless of discouraging conditions or factors, to try many ways and means of solving problems, and experiment with different materials before admitting defeat. They must also be encouraged to assume an analytical approach to problems and to suspend judgment until the pertinent facts and conditions have been given due consideration. A liberal equipment of textbooks and reference materials in the school shop is an absolute essential for achievement of this purpose.

Exercise of Judgment. Ordinarily pupils studying industrial arts are given little opportunity to express judgment despite the fact that many occasions present themselves. Occasion to make discriminations in the quality of materials, in quality of workmanship, in courses of procedure, are common requisites in normal living and should be a part of each one's preparation and training. Pupils in industrial arts should be given opportunity and practice in making judgments with respect to the merit of materials for specific purposes, with respect to the appropriateness of a particular type of construction, and in evaluating the quality and quantity of their work, regardless of kind. But some will say secondary-school pupils are incapable of making judgments or of evaluating their work. Of course, this is true, as with other things unless pupils are taught and given opportunity to make judgments. When given occasion to exercise judgments or make evaluations secondary pupils have demonstrated both ability and proficiency. This has been shown in carefully controlled experiments,[1] where it was found that secondary-school pupils were able to make scores on a measuring test comparable with those made by university students on the same test. The same experiments produced evidence that freshmen engineering students, using a standard scale, were able after five or six attempts, to rate themselves approximately as accurately as they were rated by their instructors.

Activities Undertaken Should Present a Challenge

Too frequently activities undertaken in industrial arts are not challenges to those undertaking them, consequently little learning takes place. Under such a condition certainly little will be achieved by way of development of those individual personal characteristics discussed in the foregoing. The remedy is simple, however — encourage, require if necessary, pupils to undertake problems which progressively present a challenge.

Much emphasis may appear to have been given the matter of developing personal and socially approvable forms of behavior, perhaps to the exclusion of other worthy things. Yet in support, one finds the attributes discussed to be factors, determining to a very marked extent the pattern of life the possessor will pursue — that is, a life dominated by its environment or one in which the environment is modified, for the best interests of the life of the individual and of society. Very frequently one's ability to secure employment or to hold it afterwards, is dependent upon one's adaptability to a changing environment, to assume the initiative, to demonstrate self-reliance, to exercise judgment, and to carry on independently.

To bring about these results in industrial-arts teaching does not involve a change of method impossible of achievement by the average teacher, and frequently will not involve a large expansion of equipment. The change will, however, necessitate an immediate shifting of the responsibility for learning *from the teacher* to *the pupil*, of the expansion of a workable and efficient personnel system, the securing of a large number of texts and *reference books*, some appropriate magazines, a number of

[1] Smith, Robert E., *A Study of the Habits Acquired by Students of Industrial Arts in Measuring and Judging*, Columbus, Ohio, H. L. Hedrick, 1931, 119 pp.

industrial pamphlets, and other teaching devices, such as charts, industrial displays, films and slides, and the like. Books and other teaching devices should be conveniently located and readily accessible to the pupils. They may be placed, preferably, in a glass-enclosed room at one end of the laboratory with someone in charge to see that books or other materials are properly filed at the end of the period and that *proper notation is made of borrowed materials*. Convenient location and accessibility of reference materials is essential, otherwise students will waste much time in traveling back and forth, will procrastinate or will attempt to get along without the information desired.

Just as addition to the number of activities offered did not provide an adequate program of industrial arts, neither will such be achieved by the mere addition of reference materials. A broad offering, adequate equipment, and adequate reference materials will facilitate matters, but without good method (method involving occasion for pupil thinking, initiative, judgment, participation, and self-direction) will still be ineffective and inadequate in terms of pupil development, growth, and maturation.

Shop Grading Chart

R. C. McNabb

Senior High School,
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A marking procedure which may be found helpful by many shop instructors.

The grading chart presented herewith gives a very definite basis for grading the shop boy, and with but little alteration, might be just as effectively used to grade pupils in other classes.

The rating scale is designed to take care of the slow, clumsy, indifferent boy with the same standard of values that is used in measuring the progress and achievement of the exceptional pupil. Although other factors might be used in arriving at the proper rating, the ones listed are those most pertinent in shop classes.

The chart is really composed of two closely related parts, one part having to do with those qualities or characteristics which properly determine the boy's shop ability or *aptitude*, the other part, in a similar manner, dealing with those things which concern his shop morale or *attitude*. These characteristics are arranged in the order that the observer would naturally discover the degree of their presence. For instance, a boy's interest would be noted before a knowledge of his memory could be obtained, or, the degree of his confidence could be determined before the quality of his workmanship could be estimated. These traits or characteristics are then subdivided into five parts (each subdivision being paralleled by descending values respectively) ranging from the ideal to the opposite extreme.

An entire semester's grading is provided for in the chart. And in accordance with the general practice, the semester is divided into three six-week periods. A close check is made each week and at the end of six weeks these are averaged in the space provided. This average, taken with the test, workbook, or other grades, constitutes the pupil's grade for the six weeks. At the end of the semester, a space is provided for the averaging of the several six-week averages, etc., to determine the semester grade.

If this chart is followed, it will definitely take the "guess" out of shop grading and quickly restore the pupils' faith and confidence in the fairness of the instructor's marks.

SHOP GRADING CHART

Name _____, _____
Type Shop _____
Classification _____
Semester Grade _____

_____ Semester 19 _____

			Scale	First Six Weeks						Average	Second Six Weeks						Average	Third Six Weeks						Average	Semester Average
				Week							Week							Week							
				1	2	3	4	5	6		1	2	3	4	5	6		1	2	3	4	5	6		
Shop Ability (Aptitude)	Confidence	Inspiring	9																						
		Positive	8																						
		Certain	7																						
		Uncertain	6																						
		Lacking	5																						
	Speed	Swift	9																						
		Fast	8																						
		Standard	7																						
		Moderate	6																						
		Slow	5																						
	Accuracy	Exact	9																						
		Accurate	8																						
		Adequate	7																						
		Faulty	6																						
		Inadequate	5																						
	Aptness	Adept	9																						
		Clever	8																						
		Handy	7																						
		Clumsy	6																						
		Botchy	5																						
	Workmanship	Expert	9																						
		Skilled	8																						
		Satisfactory	7																						
		Mediocre	6																						
		Crude	5																						
Shop Morale (Attitude)	Interest	Intense	9																						
		High	8																						
		Normal	7																						
		Moderate	6																						
		Low	5																						
	Curiosity	Eager	9																						
		Inquiring	8																						
		Average	7																						
		Passive	6																						
		Indifferent	5																						
	Resourcefulness	Ingenious	9																						
		Outstanding	8																						
		Reliable	7																						
		Ineffective	6																						
		Helpless	5																						
	Initiative	Diligent	9																						
		Industrious	8																						
		Willing	7																						
		Listless	6																						
		Indolent	5																						
	Memory	Excellent	9																						
		Retentive	8																						
		Average	7																						
		Fair	6																						
		Defective	5																						
Tests - Workbooks - Etc.			10-0																						
Total Averaged Score			100																						

A Desk Set in Copper—VII

Leon H. Baxter

Association for Crippled and Disabled, Cleveland, Ohio

The seventh of a series on an interesting art-metal project.

Ink-Bottle Holder

This is an interesting but more difficult problem in accurate measuring, bending, and fitting.

First, purchase a bottle of the ink desired in a square bottle.

Carefully measure the height and distance around, and lay out a pattern to the required dimensions, allowing a scant sixteenth of an inch in length on every side and height. See the outline plan on Plate 8. Fold on the vertical lines and try around the bottle.

When the pattern is satisfactorily fitted, cut out a piece of 18-gauge copper to correspond. Planish one entire surface and anneal to soften. Bend on the lines at a sharp right angle and file the two adjacent edges to fit at 45 deg. Clean and bind the form for soldering. After soldering see that the frame fits flat and true at both top and bottom. File if necessary.

Cut the base E from the same gauge copper 2 13/16 by 3⅛ in. and measure and cut out the V-shaped pieces at the corners. Planish as before and anneal and bend up the sides carefully. The flat surface should now be 2 1/16 by 2⅜ in. To insure a good fit at the corners the angle edges should be filed to a bevel that will insure a close joint. Turn the piece bottom side up and place flux, and solder on the joints, and apply the heat.

Clean thoroughly and try the frame to see that it fits level on the base. When satisfactory apply flux on the inner edge of frame and place small bits of solder around the contacting edges. Keep the wire binding about the frame to prevent the joint from opening up when heat is again applied. Apply heat and watch to see that the solder runs evenly all about the base joint. Remove wire, clean with the *pickle*, and brighten with fine steel wool.

Make a paper copy of the design and glue to a piece of 20-gauge brass. Cut out and finish nicely as described in previous projects. Apply flux and solder to the back of the design. Now place on the surface furthest from the joint edge. Solder and finish with the pickle dip and fine steel wool.

The top F is made 2⅝ by 2 15/16 in. and squares marked and cut from each corner as shown. Draw the diagonals of the figure and with a pair of dividers or a compass scribe a circle large enough to allow the neck of the ink bottle to pass through easily. It should be about 2⅞ in. in diameter.

Drill a small hole near the edge of the circle and insert one end of the saw blade. Tighten blade in place and saw carefully to the line. Finish with a half-round file. Planish the piece, anneal, and bend on the lines drawn from the inner corners of the cut squares.

A small collar is next cut, 3/16 in. high. File smoothly to fit flat on subcover B and planish all over. After annealing, bend to a perfect circle to fit the hole being sure the contacting ends are square and true. Bind with wire tightly and apply flux and solder on inner edge of the point and apply heat. Leave the wire bound around the collar until soldered to B.

(Continued on page 192)

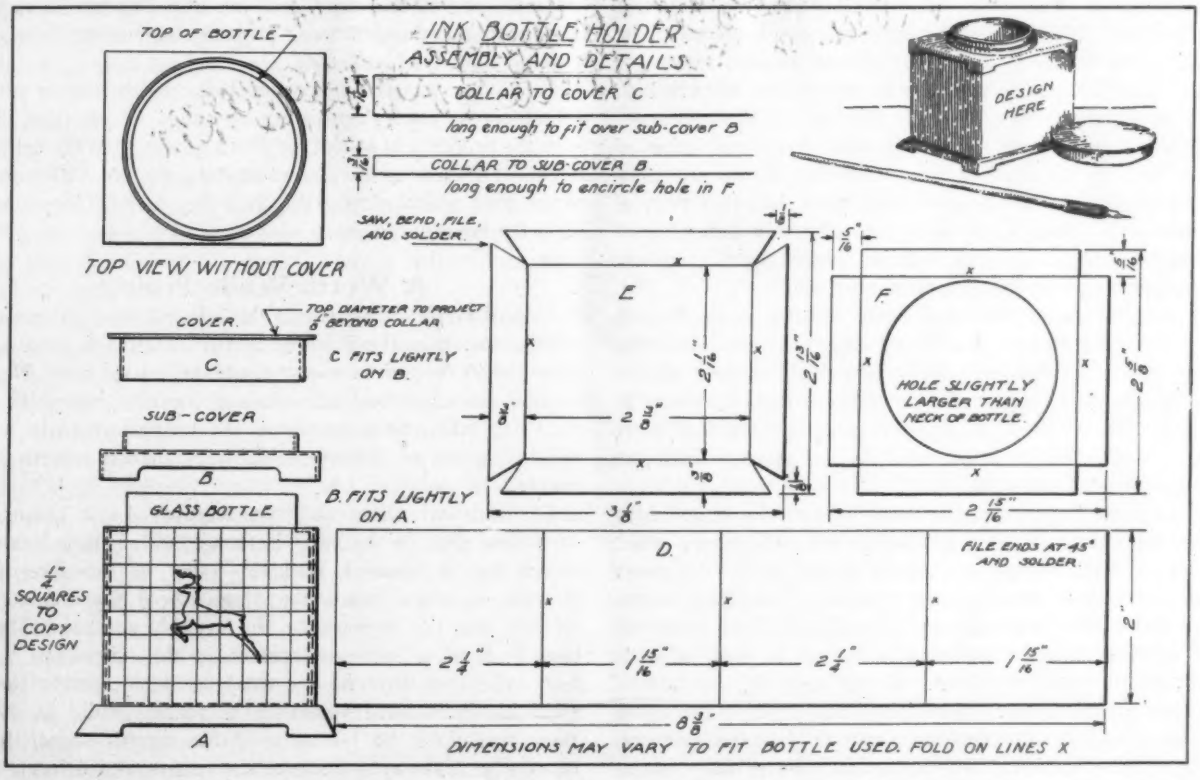


Plate 8

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Just Think It Over

Recently an official of one of the large manufacturing companies related that his firm, on several occasions, had obtained a great number of letters, all asking for the same information about the company's product, and all coming from the same school. Evidently an entire class had been directed to write for information about a given material.

A little reflection will show the great amount of unnecessary work that would be entailed in answering all of the letters coming from one school. Then multiply this by the thousands of high schools existing in this country and picture the waste of time, effort, and in some cases, valuable material.

Much as industry may be interested in presenting a complete picture of its product to the people, common sense dictates that there must be a definite ratio between the amount of money expended for promotion and advertising, and the income derived from such an effort.

Of course, some instructors may argue that the student derives a great deal of benefit from such a direct contact with business and industry. This is true and this point should not be overlooked since the good of the student must always be paramount in the mind of the teacher. However, can not this objective be gained in a simpler and more economical way? There are numerous materials used in every industrial-arts shop in this country. Before most of these materials are ready for use, either in the school shop, the home shop, or in industry or business, each of them will require treatment of some kind to produce differences in quality, workability, purity, composition, form, and the like. All of these changes in the raw material entail more or less interesting items of information for the student who wants to know not only what material he is to use in a given case, but just why he is to use it as well. There are, then, literally hundreds of items of interest which may well be studied by the student of industrial arts and vocational education.

The shop teacher, then, can easily arrange to have each one of his students get first-hand experience in contacting business and in getting real practice in writing business letters. All he has to do is to list, first of all, the materials that he uses in his shop. Next, he must analyze the different steps through which this material went in its passage from the raw state to the finished article.

Having done this, he can set his boys to work gathering information. Much of it is obtainable from the books which each shop teacher has, or should have, in his reference library. Some of it, however, may best be obtained by writing to the firms who manufacture or market given materials. Every student in the class may be asked to write a letter requesting information about, let us say, the method of producing a certain type of metal. When all of these letters have been written, the best one may be selected and only that sent. The writer of the outstanding letter may further be honored with the assignment of presenting to the class a résumé of the information sent him in answer to his letter.

This method may be repeated for each of the other items of information that may be wanted. A little ingenuity on the part of the teacher may be required to see that every boy in the class will have the opportunity to write a letter to some firm for a definite piece of information.

In this way, much valuable related material may be obtained at small expense, and without deluging any one firm with mail that will have to be read and probably answered by someone who can ill afford to waste the time required to answer the numerous letters now poured in upon him by thoughtless teachers.

There is also another side to this question. What opinion will businessmen and industrialists have of a teacher who subjects them to such an ill-planned campaign as that mentioned in the opening paragraph of this editorial? Every manufacturer and dealer, especially those who send their products all over the United States, will be glad to give information about their wares. Most of them will gladly answer a few letters from each school system, but it is unreasonable to ask them to engage in a wholesale letter-writing contest with the millions of boys who attend the school shops of our country.

Preparing for Vacation Needs

Prepare your students now for the time when the vacation period releases them from school surveillance. Build up in them safety concepts which will stand them in good stead when they are dependent entirely upon their own judgments and decisions.

There are the traffic dangers, the danger of falls from trees and other high points that venturesome youth tries to reach, the poisoning from various types of plants, dangers of causing fires, dangers of drowning, and the like. Discuss these situations with them and thereby probably save some lives, or at least prevent much suffering.

Then, there are the many situations which lead to juvenile delinquency. The congregating in gangs which take liberty with the property of others, or which go out with the deliberate intention of causing damage or starting trouble. Call attention to the good which membership in a Boy Scout Troop conveys. Help the boy go straight.

A Worth-While Project

From Raleigh, N. C., comes the information that school-bus transportation in the State of North Carolina is furnished to about 300,000 children every school day of the year. Needless to say, the movement of so much youthful humanity twice each day adds many busses to the traffic stream in a state which has one of the worst highway-accident records in the country.

To transport these children requires 4,179 busses. The surprising part of the news is that 3,600 of these busses are driven by high-school students — this in the face of the remark so often heard that high-school auto drivers are reckless and not dependable. So far, this year, there has not been a fatal or serious accident in the school-bus system. Last year recorded but one fatal accident. During the year 1935–36, there were two such accidents, while in 1934–35 there was none. So far as available records show, there is no similar highway transportation system which has a better record than that set by these young high-school chauffeurs.

North Carolina's experience with high-school bus drivers

runs back over a period of five or six years. During that time, this state has found that in most instances, students are as cautious and as dependable as most adult drivers. Furthermore, these young drivers, for the most part, take greater interest in their youthful passengers than do the older chauffeurs.

The state, however, expends the greatest care in the selection of these youthful drivers, most of whom are boys, but there are a few girls, too. Each must be at least sixteen years of age, possess a high intelligence rating, and be of excellent character. Besides this, they must maintain a high standing in deportment and scholastic attainments. Candidates for driving positions are nominated by the school principals. Then they are given a very strict examination by the State Highway Patrol. This examination covers both state driving laws and actual bus driving. The Highway Safety Division thereupon issues a certificate with the candidates' standings in the subjects in which he was examined.

In the training of these youthful drivers, emphasis is also placed upon watchfulness when busses are loaded and unloaded. To do this efficiently, the drivers are assisted by one or two older students who act as monitors. These help the smaller pupils on and off busses where necessary. They also supervise the children who have to cross the highway after leaving the busses.

This plan, which works so well in North Carolina, can be used with equal success elsewhere. It surely is worth serious study. It gives a very worth-while objective to the study of automotives, in which safe driving is receiving more and more emphasis. Then, too, the psychological effect on those found worthy of being recommended as fit to be entrusted with the lives of his or her younger schoolmates, will have a far-reaching effect in building up worth-while character traits not only in the successful candidates, but also in those striving to perfect themselves so that they too might at some time or other receive the coveted position of driver of the school bus.

Requisition Time

The end of the school year is fast approaching. That means that the teacher will have to take care of a number of things within the next few weeks, most of which will require much careful planning and forethought.

Among the most important items that clamor for immediate attention is the matter of making out needed requisitions. Many of the things requisitioned will require considerable prior study in order to determine which of the many products offered will best suit the requisition writer's needs.

There may, for instance, be need for requisitioning major pieces of equipment. Or materials and supplies for the next school year are to be ordered. Before any of this can be done, the size, make, type, and quantity of each item must be determined. This, again, requires a study of such factors as kind and size of project to be made, class size, number of classes, and the like.

Then, there are other items that may have to be considered, such as replacements, alterations, and repairs. Again, these items must be carefully studied, markets must be looked up, specifications written, and the like.

To get the information on most of the items mentioned, shop teachers need but to look at the advertising pages of the current and special issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. The March issue, for instance, is known as the School Shop Annual. Its pages are filled with much definite information that will be found useful now that requisition time is at hand.

The lists of equipment, materials, and supplies covering woodworking, metalworking, automotives, printshop, drafting, and electrical work which appear in this Annual are of special value to the teacher or supervisor confronted with the task of making out requisitions. They will be found especially valuable as checking lists, having been designed for maximum rather than minimum requirements. Furthermore, the use of the Annual will obviate the necessity for much reference to, and paging through, numerous catalogs.

With this helpful manual on shop layouts and shop equipping at hand, it is hoped that readers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION will find requisition time this year less troublesome and arduous than it has been in the past.

The Use of Tests

As the end of the school year approaches, the question of tests and examinations begins to assume prominence. There are still many shop teachers who feel that they can correctly grade their students by merely glancing at the project or projects which they have produced. This method of arriving at a grade, however, recognizes but a few of the total number of factors which ought to be taken into account when settling the final mark for a course in industrial arts or vocational education.

Of course, there are many teachers who hold that no examination ought to be given at any time. This, however, does not seem to be a worth-while contention. It does not agree with life situations either, for life applies not only difficult but searching tests, and without respect to persons. There is no question of whether the essay type or the objective type of examination is to be used. Each teacher must decide that for himself. Many of the older instructors still favor the essay type. With all its defects, it is better than no test at all.

Some have a decided antipathy against the true-and-false type of test. However, this is not the only kind of objective test that may be used. The different kinds of tests which have appeared in the various issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION for the past several months give proof of this. Yet, the tests that have been published are not to be looked upon as being the perfect tests. No doubt, many of them embody minor defects. All of them could be changed in this or that detail, thereby probably improving them. They do, however, represent good examples of what earnest, hard-working shop instructors have devised in order to make their work more effective.

At this time, then, it is well to take up this matter of tests and testing. Look over the many examples that have appeared in this magazine, and either use them as they are or change them to suit personal preferences or special conditions. Better yet, examine the various types of standardized shop tests that are being published, and if they are found suitable, use them. Standardized tests have the advantage that they not only measure the knowledge and achievements of students, but they also disclose how the teacher's instructional work compares with that of other instructors the country over. This type of test, therefore, should not be overlooked.

Testing is a necessary part of the instructional procedure, and it should not be disregarded by teachers of any subject.

(Continued from page 189)

After soldering to subcover B, clean and lay aside and cut a strip for the top, large enough to go around and fit easily on the previously made collar. This piece, C, is to be 7/16 in. wide. Planish, bend, file, and bind with wire and solder together. Keep binding wire in place until collar C is soldered to a desk with a diameter large enough to project ⅛ in. beyond the collar itself.

Make this top piece true and smooth and then planish, clean, and attach to cover collar C, the pieces of solder being placed around the inner edge. Remove wire and clean.

If all pieces have been accurately made the three units should fit together easily and have a workmanlike appearance.

Clean and fume and after removing from the fuming jar the piece should be cleaned and brightened with steel wool. Wax should then be applied and rubbed to a polish.

Lessons for Young Workers—V

Thomas Diamond

Vocational Education Department,
University of Michigan,
Ann Arbor, Michigan

The fifth of a series of suggestive lessons designed to help students of industrial arts and vocational education.

Capital, Management, and Labor

You will notice that this chart is similar to the one in the preceding lesson. In this case, however, we have divided the factory organization into three distinct divisions: Capital, management, and labor.

It was pointed out in a previous lesson that the stockholders supplied the money to carry on the business, and that the directors were elected from that group. Because they have supplied the money, they own any buildings, equipment, or materials belonging to the company. These things constitute the assets of the company and form part of its capital. Since this is true, the top division in the chart has been called "Capital" and those included in it are capitalists.

The people in the next division carry out the policies of the directors and attend to the management of the business; hence they are grouped under the heading of "Management."

The third group is made up of the men who do the actual manufacturing and are classified under the heading of "Labor."

Now there are some in the labor group who believe quite sincerely that capital is unnecessary, and that the men who actually do the work could do business without the capitalist. In other words, they contend that if there are plenty of *workers* to do the work now done by the capitalists, the men who live on Wall Street, as they put it, would be unable to collect a share of the profit from the product which they have never seen and which they have not helped to manufacture.

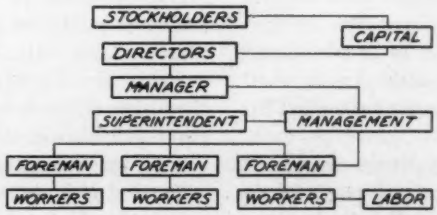
Let us imagine for a moment that we have a group of workers who have a desire to start in business. They believe that the capitalist is unnecessary and that, since they do the actual work, they ought to be able to organize a business to make articles for sale. The first thing they are confronted with is the need for a place to work. That involves purchasing a site. Where is the money for the site to come from? Let us suppose for a moment that some progressive city offers them a site free in order to attract their concern to that city. The next thing they will need is a building. After the building, equipment must be bought. Articles cannot be made without materials, so these must be bought and stored. Then, again, the workers dislike waiting for their pay until their goods are sold, so money must be found to pay wages as they come due until enough goods are sold to cover the wage bill.

All these things involve the use of money and all that the workers have is their labor. If they are able to supply the money themselves, then they immediately become capitalists and become members of the first group in the chart as well as of the third.

It must be obvious, therefore, that business cannot be carried on without buildings, equipment, supplies, and credit; consequently, the capitalist is an essential part of any organization.

Let us assume again that the capitalist wishes to start a factory. He purchases a site, erects excellent factory buildings, buys the most modern machinery he can find, and lays in an abundant store of materials. In addition to this, he arranges with his banker that the factory will be given unlimited credit to meet its wage bill and other expenses as they occur. He is all ready to start work but he has no workers. Can he profitably carry on his business without labor? No, he cannot. Therefore, labor is just as essential to the carrying on of any business as capital is.

In the third case, the capitalist has all his arrangements made to start and has obtained the promise of sufficient labor. However, he neglects to assure himself that his management is sound so his project goes bankrupt. The capitalist loses his money and the worker loses his job. In other words, good management is as essential to the success of a firm as capital or labor.



The conclusions we may reach in this lesson are:

1. In any industrial organization there are three divisions: Capital, management, and labor.
2. Each of these is necessary to the other two.
3. Where the workers supply the necessary equipment, tools, and labor they occupy a position in two divisions of the chart; first in the labor division because they supply the labor, and second in the capital division because they supply the means of doing business.
4. Co-operation between these three divisions is absolutely necessary if a company is to be successful.

Questions for Discussion

1. What does the capitalistic group contribute to an organization?
2. Is it not true that many in this group never see the factory?
3. Does this fact justify the attitude of some members of the labor group who feel that they can get along nicely without the capitalist?
4. If we had a firm alliance between capital and labor could we not run a fairly efficient business without the management division?
5. How does management contribute to the efficiency of an organization?
6. Why is co-operation between the three factors in industry necessary to its success?

(To be continued)

School Hobby Shows

Joel F. Maurer

Burdick Junior High School,
Stamford, Connecticut

Extending the school's influence beyond the confines of the school walls.

The season for hobby shows will again soon be with us. Plans are being formulated at the present time, for the Burdick Junior High School's fourth annual hobby show.

The first hobby show in our school was held in the assembly hall in 1935. The object of the show was to encourage pupils and parents to adopt worth-while leisure-time activities. More than 450 exhibits were displayed by over 400 students of the school. These exhibits represented the results of hobbies of pupils carried on outside of school hours. The exhibits were seen by the pupils of our school and of other schools, and one afternoon was open to adult visitors.

In April of 1936, our second show far exceeded the expectations of the committee. The show lasted one week. There were 12 booths and several tables used for the exhibit and even the stage was occupied by some of the displays. Ye Olde Kings Highway Stamp Club furnished stamps for sale at one booth, the Stamford High School Camera Club exhibited their pictures in another. A few outsiders loaned exhibits to build community interest. The public was invited, not only during the day but also to the open house held in the evening, when the school band presented a program.

January, 1937, furnished a week for our third hobby show. During the week about 4,000 adults and children visited the exhibit. The night-school students attended in a body on one evening, and outside schools sent classes during the day. The program on the open-house night, was well received. Talks by Rev. Floyd Leach of Ye Olde Kings Highway Stamp Club, an authority on stamp collecting; by Judge Edward Fisher, of the Stamford Camera Club; by Prof. Phipps of New Britain Teachers College; by Superintendent of Schools Leo C. Staples; and music by a teacher's quartette and by the school band constituted the program. The local paper assisted with pictures and stories of the show. Exhibits were entered by collectors from 11 years of age up to 82 years of age.

The booths, tables, and equipment were built in the general shop. The Art Department decorated the booths and the assembly hall. The Print Shop printed the tickets for adult admission. (These tickets were free.) Committees of students received and arranged the exhibits and during the week, groups of boys and girls had charge of the various booths, explaining or answering questions about their pet hobbies.

Perhaps the spirit of the hobby show can best be expressed by quoting some of the slogans that were posted about the assembly hall:

"A boy with a hobby has pleasure and treasure."

"A hobby drives away dull hours."

"Let your hobby lead you to success."

"Spend your leisure time wisely."

Hobby enthusiasts love to show off their collections — as one woman of 74 years remarked about her British Colonial collection of stamps, "What's the use of having a collection if you can't show it off to others and encourage them to collect?"

We plan on giving our students another chance to show off their collections. Weeks before the days of the show are announced, requests have been made to exhibit and to work in the booths.

Miniature Rooms

A. G. Pelikan

Director of Art,
Public Schools,
Milwaukee, Wisconsin

A worth-while project in which the industrial-arts and art departments of various junior and senior high schools co-operated.

A most fascinating and instructive problem in which the industrial-arts and art departments collaborated was recently carried out by a number of the junior and senior high schools in Milwaukee. Each year the Home Show has a competition for a small house which is built and given away as an attendance prize to the lucky winner whose number is drawn on the last evening of the Home Show. This year's home was a well-designed Colonial home which cost about $7,000 and which was nationally publicized because of its excellent plan and appearance.

As chairman of the educational committee of the Home Show it occurred to me that these plans would furnish good instructive material to the students in our high-school art departments, who were studying home planning and interior decoration. With this in mind I secured 100 complete blueprints of the model home and these were distributed to those art teachers who were interested in having their students take these plans and make miniature rooms to scale. An opportunity was offered to the students to visit the house and to examine the actual rooms which they intended to carry out in miniature. In one school the art students became so interested that over 30 of these model rooms were made.

The best work resulted where the student had some training in the industrial arts or where the art department and the industrial-arts department co-operated with each other. Altogether about 100 models were made and these were exhibited at the Milwaukee Art Institute for two weeks, and in the City Auditorium in connection with the Home Show for one week. Over 100,000 people saw this exhibition which was greatly admired. Two of the rooms illustrated were made under the capable direction of Mr. E. Boerner, in charge of the art department at Bay View High School.

The model of the recreation room and workshop shown in Figure 1, was made by Billy Angus Tito, age 18, a senior in the industrial-arts course and a fourth-semester student in the art course. The scale of the model is 1½ in. to 1 ft. The floor and walls are of ¼-in. basswood ply board, nailed and glued. The furniture is of stained pine, glued and nailed, all made to scale, and designed for practical use. There are also a woman's worktable and chair, a workbench with vise, and a bench for power tools, such as, drill press, band saw, and turning lathe. The hand tools are made of tin. The drawing table with stool, a drawing board, and T square and triangle are also shown. Then there is a bookcase with books and magazines; a ping-pong table with net, balls, and bats; pictures; waste basket; broom; dustpan; an unfinished chair and an extra stool; also two tool cabinets on the walls; and some paint cans. All of these

Fig. 1

Fig. 2

Fig. 3

Fig. 4

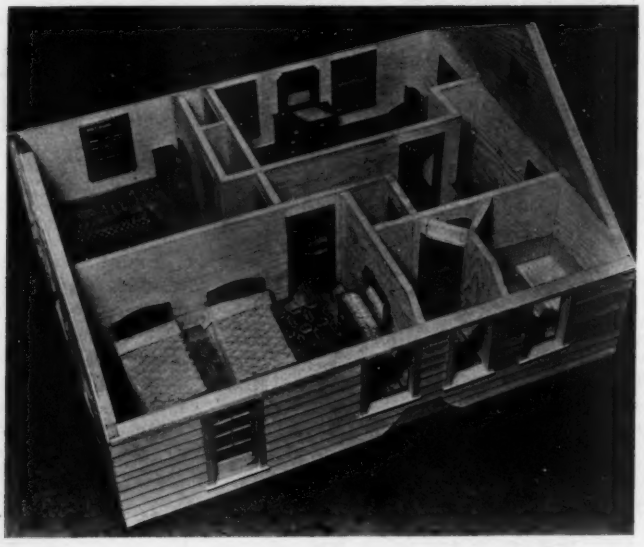


Fig. 5

objects are glued and nailed from the bottom.

The room was designed as an expression of the boy's own desires for real recreation, not only for pleasure. He enjoys woodworking, wood carving, drawing, painting, and designing. All the work was done with a minimum of teacher help. What help was given was in the way of mere suggestion and in making the boy think constructively.

The master bedroom shown in Figure 2, was made by Gunther Glister, age 18, senior, Bay View High School, science course, fifth semester in art course. Scale 1½ in. to 1 ft. Floor and walls of ¼-in. basswood ply board, nailed and glued. Moldings of basswood, worked with special tools and ingenious use of sandpaper. All gluing was done with clamps. The doors of basswood are paneled, and are equipped with glass doorknobs. The bed, dresser, bedside table, and chair were designed to harmonize with the house exterior. There is a clock lamp on the bedroom table. Then there are magazines, books, and pictures. The copper wall lamps were designed and wrought. The rug is made of dyed velvet. The walls are painted a flat apricot color, and the doors and woodwork a light ivory. The furniture is of light rubbed maple. The dresser scarves are crocheted, and a tufted bedspread, and curtains were specially made for the room.

The room is designed for rest and comfort, with a minimum of furniture and accessories. The teacher helped by giving suggestions when needed.

The most ambitious program was carried on at West Division High School where Miss Lulu Cropperhead of the art department and Mr. G. Steuerwald in charge of the industrial-arts department, worked together. In this case the industrial-arts student made a complete scale model of the Home Show home in three sections. See Figures 3, 4, and 5, which represent the first floor, the second floor, and the roof. Every detail was carried out minutely and with great skill. Partitions, doors, stairways, fireplace, etc., were all carefully represented and each room, including the bathroom, was completely furnished. Rugs were woven in the art room and plumbing fixtures were modeled in clay and plaster.

The entire school showed a lively interest in the project. Students measured their furniture at home and one boy who failed to do this found to his dismay that all of the furniture which he made for one of the rooms was out of scale and could not be used.

An examination of the illustrations will show the high degree of skill and ingenuity used by the students in making the models. This goes to prove that teaching can be made more purposeful and the learning process stimulated where interest in a worth-while project is aroused by the teacher.

Testing and Tests

ELECTRICAL TEST

8th-Grade Industrial Arts

G. L. Simnicht
High School,
Elk River, Minnesota

DIRECTIONS: Answer the following questions by writing the word *true* or *false* in the blank space provided before the question.

1. ——— More people are electrocuted than are drowned.
2. ——— A shock from a 110-volt circuit will kill you.
3. ——— No one knows exactly what electricity is.
4. ——— Northern lights are caused by electricity.
5. ——— Electricity is our most important source of power.
6. ——— Wood is a good conductor of electricity.
7. ——— Glass will not carry electricity.
8. ——— Porcelain is one of the most common insulating materials.
9. ——— The larger the wire, the more current will flow through it.
10. ——— Electric currents generate heat.
11. ——— The heating element in a toaster is made of copper.
12. ——— Every electric current generates some heat.
13. ——— Fuses are used to prevent shocks.
14. ——— A penny makes a good fuse plug.
15. ——— It costs four times as much to operate a 60-watt bulb as it does a 15-watt bulb.
16. ——— All wires used to carry electricity are insulated.
17. ——— The armature of a motor is the part that turns.
18. ——— The fine copper wire you used in making your motor is insulated.
19. ——— Everyone should be afraid of electricity.
20. ——— There are brushes in an electric motor.
21. ——— There is a magnet in a doorbell.
22. ——— You used an electromagnet in your motor.
23. ——— You used an electromagnet in your telegraph set.
24. ——— There must be two terminals on every bell or buzzer.
25. ——— A permanent magnet is made of steel.
26. ——— An electromagnet is made of steel.
27. ——— "ELECTRICETY." This word is spelled correctly.
28. ——— An iron wire will not carry electricity.

Key

1. False	8. True	15. True	22. True
2. False	9. True	16. True	23. True
3. True	10. True	17. True	24. True
4. True	11. False	18. True	25. True
5. False	12. True	19. False	26. False
6. False	13. False	20. True	27. False
7. True	14. False	21. True	28. False

TEST FOR GENERAL METALWORK

G. L. Simnicht
High School,
Elk River, Minnesota

DIRECTIONS: Place the correct word or words in the blank space provided.

1. Iron is one of the earth's most common ———.
2. Iron first appears in the form of ———.
3. The ——— streaks in rocks denote the presence of iron.
4. Two materials necessary in the smelting of iron are ——— and ——— ———.
5. Name a town noted for its iron-ore refining. ———.
6. Iron ore from ——— is of higher grade than that found in the United States.
7. Name the three states where most of the iron ore is found in the United States. ———.
8. The chief steel center of the south is ———.
9. Some of the impurities found in iron ore come of ——— during the smelting operation.
10. Another name for iron oxide is ———.
11. The smelting of iron ore is done in a ———.
12. The bricks used in the blast furnace are called ———.
13. The product of a blast furnace is called ———.
14. Steel is made from ——— ———.
15. The Bessemer process of steel manufacture was invented by ——— ———.
16. The inventor of the Bessemer process was a native of ———.
17. The two most important methods of steel manufacturing are the Bessemer and the ——— processes.
18. Soft machine steel is also called ———.
19. Three fourths of the iron ore in the United States comes from the ——— ——— region.
20. Castings for parts that require great strength are made of cast ———.

Key

1. Elements	10. Rust
2. Ore	11. Blast furnace
3. Red	12. Firebrick
4. Coke and limestone	13. Pig iron
	14. Pig iron
5. Pittsburgh	15. Sir Henry Bessemer
6. Cuba	
7. Alabama, Michigan, Minnesota	16. England
	17. Open hearth
8. Birmingham	18. Mild steel
9. Slag	19. Lake Superior
	20. Steel

ELECTRICAL TEST

G. L. Simnicht
High School,
Elk River, Minnesota

1. Electricity is transmitted by ———.
2. Electricity is commonly compared with ———.
3. Two common conductors are ——— ——— and ———.
4. The best substance for insulating wire is ———.
5. Cotton or silk is a poor conductor of electricity when ——— ———.
6. To make an extension cord ——— ——— is used.
7. Water flows through a pipe because of its ———.
8. Two names for electrical pressure are ——— and ———.
9. That chemicals may be used to generate electricity was discovered by ——— ———.
10. The two metals first used in an electrical cell were ——— and ———.
11. ——— and ——— are two substances used in a dry cell.
12. The plates of a storage battery are made of ———.
13. ——— acid is used in a storage battery.
14. Storage-battery containers are made of ———.
15. The cells of a storage battery are wired in ———.
16. Most storage batteries have ——— ——— cells.
17. Many storage batteries are used in ———.
18. When adding water to a storage battery, use only ——— water.

19. For testing a storage battery, the ———— is used.
20. A fully charged battery-test reading is ———— to ————.
21. A discharged battery-test reading is ———— to ————.
22. The voltage of the battery in a car is kept up by the ————.
23. Each cell of a storage battery produces ———— volts.
24. A dry cell produces ———— volts.
25. Electricity ———— flow out of the end of a wire.
26. To make electricity flow ———— ———— is required.
27. The resistance to the flow of electrical current is measured in ————.
28. The switch used on a bell-wiring job is called a ————.
29. ———— wires are necessary to connect a bell, dry cell, and a switch.
30. A ———— battery should be used with a 1½-volt bulb.
31. Lamps may be connected in ———— ———— or in ————.
32. The headlights on a car are connected in ————.
33. The amperage being the same, a large diameter wire will heat ———— than a small one.
34. The ———— ———— of an electric flatiron causes it to get hot.
35. Fuses are used to ———— electrical circuits.
36. Two types of fuses are ———— ———— and ————.
37. Before changing fuses, always ———— ———— the ————.
38. The wire in a light bulb is called the ————.
39. The incandescent lamp was invented by ————.
40. The light filaments today are mostly made of ————.
41. There must be ———— conducting circuits between every light and the source of electricity.
42. The material usually used for the conducting circuits is ————.
43. When too much current is forced through a wire ———— is generated.
44. A short circuit causes the ———— ———— to ————.
45. Electrical pressure is measured in ————.
46. The rate of flow of current is measured in ————.
47. The instrument used to measure the voltage of a circuit is called ————.
48. Three dry cells wired in series will furnish ———— volts.
49. Four dry cells wired in parallel will furnish ———— volts.
50. The voltage of an ordinary lighting circuit is ———— volts.
51. The ability of the work done in an electric circuit is measured in ————.
52. A kilowatt hour means the consumption of electric energy at the rate of ———— volts for ————.
53. A 100-watt bulb consumes ———— ———— watts.
54. The body must be part of an electric ———— before you get a shock.
55. The human body is a ———— conductor of electricity.
56. A person holding both terminals of an ordinary storage battery ———— get a shock.

Key

1. Conductors
2. Water
3. Copper and brass
4. Rubber
5. Wet
6. Lamp cord
7. Pressure
8. Electromotive force or voltage
9. Volta
10. Copper and zinc
11. Copper and carbon
12. Lead
13. Sulphuric
14. Rubber
15. Series
16. 3
17. Automobiles
18. Distilled
19. Hydrometer
20. 1,275 to 1,300
21. 1,125 to 1,150
22. Generator
23. 3
24. 1½
25. Does not
26. Pressure or voltage
27. Ohms
28. Push button
29. 3
30. Dry
31. Series, parallel
32. Parallel
33. Less
34. Heating element
35. Protect
36. Plug, cartridge
37. Pull main switch
38. Filament
39. Thomas A. Edison
40. Tungsten
41. Two
42. Copper
43. Excessive heat
44. Fuse-blow
45. Volts
46. Amperes
47. Voltmeter
48. 4½
49. 1½
50. 110
51. Watts
52. 1,000 — 1 hour
53. 100
54. Circuit
55. Poor
56. Will not

Problems and Projects

A UNIT PROBLEM IN MECHANICAL DRAWING

The Bench Grinder

W. A. DeVette, Erie, Pennsylvania

The mechanical drawing shown in perspective on page 201, is a good problem for advanced drafting classes. It may be used for both detail and assembly drawing by advanced machine drafting students or by trade drafting classes.

The problem involves ball bearings and consequently a number of decimal dimensions, including limits or tolerances, such as are used on industrial drawings, will be encountered. Allowance is made in the design for expansion due to heat. Right- and left-hand threads, and coarse and fine threads, are involved in the design. This, therefore, offers excellent opportunities for related information at the time of application.

WROUGHT-IRON DRAGON DOOR KNOCKER

Howard R. Junker, Senior High School, Port Washington, New York

The useful as well as ornamental dragon door knocker described herewith is made of hand-forged iron. Students should be urged to make their own design embodying the same type of processes. It may prove very helpful to have the student first work up a tentative design in modeling clay. This enables him to see how the finished article will look.

Procedure:

1. Lay out background design on cardboard. Then cut out the pattern.
2. Transfer design to metal by scribing around pattern.
3. Cut out background shape.

a) By drilling a series of holes in line and cold chiseling between holes.

b) By hack-sawing straight sections.

4. Finishing up shape.

a) By grinding on emery wheel.

b) By filing.

5. Lay out and drill the three 3/16-in. holes used to fasten knocker to the wall.
6. Cut out with a hack saw, the pieces of angle iron, for the brackets.
7. Lay out and drill the four 3/16-in. holes in the bracket pieces.
8. Shape up these pieces on the grindstone. Use the pliers to hold them, while doing this.
9. Finish up with a file.
10. Ball-peen bracket pieces and background plate.
11. (NOTE: The following operations up to and including 19 are all done while the metal is red hot.)
12. Heat up about three inches of the 5/8-in. square iron.

13. Clamp quickly in vise, 2 in. from heated end.
14. Upset by hammering to form heavy part of head.
15. If necessary reheat several times.
16. Form up snout with the fuller on the anvil.

Dragon door knocker

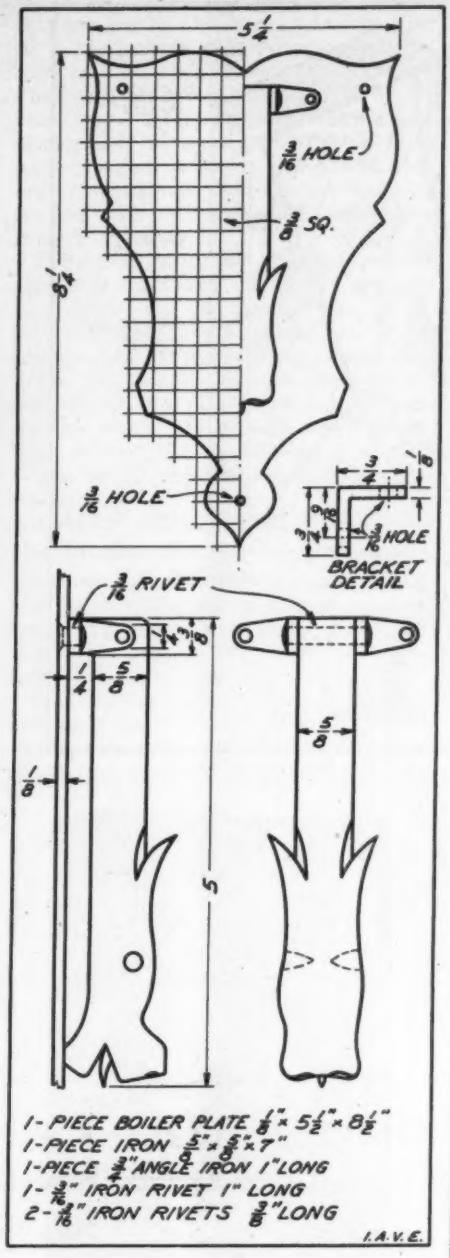
17. With the hot chisel split open the mouth. Split out section for the tongue.
18. Form nostrils and eyes with hot punch.
19. Curve up ears with curved, hot chisel.
20. Lay out and drill 3/16-in. hole in other end of knocked bar.
21. Rivet brackets to knocker bar.
22. Lay out holes for bracket on back plate.
23. Assemble knocker to back plate with 3/16-in. rivets.
24. Finish by applying linseed oil and burning it over an open flame, or apply clear lacquer or metal paint.

Questions:

1. When using a grinder what are some of the safety precautions to take into consideration?
2. What does overheating do to iron?
3. Why is it improper to use a hack saw on the narrow edge of the metal?
4. Can metal be sawed as quickly as wood?
5. Are all files made in the same manner? Why not?
6. What other metals would be good to use for a door knocker? Why?
7. Why does a burn hurt? How does the proper treatment alleviate the pain?
8. If corrosion is caused by the combining of metal and oxygen what substances might prevent this action?

References:

Elementary Wrought Iron, Bollinger.
Exercises for Forge Shop Practice, Buffalo Forge Company.
File Facts.
Hacksawology.
The Story of Carborundum.
Boy Scout or Red Cross Booklets.



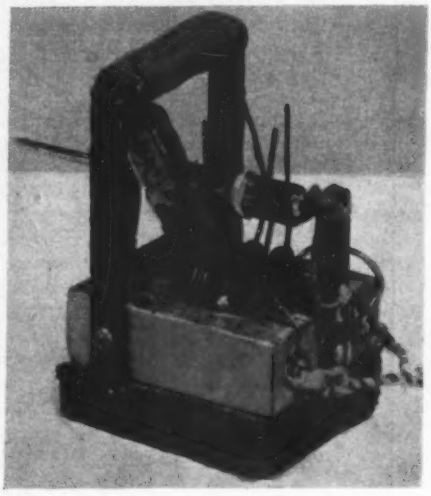
Details of door knocker

AN EXPERIMENTAL ELECTRIC MOTOR

Byron M. Taylor, Chairman, Industrial-Arts Department, Woodrow Wilson Junior High School, San Diego, California

The electric motor has always been popular with the boy student in the electric shop. This is fortunate, as the construction of this simple motor objectifies many electrical principles. The motor is experimental only in the sense that it is not designed to do work, but to accent knowledge. Apart from that, it runs, and runs well, even when put together by unskilled hands. As to cost, it is very small; and as to practicability, this is evidenced by the many hundreds that have been successfully built by as many students. The motor is designed to run on 6 to 12 volts A.C. or D.C.

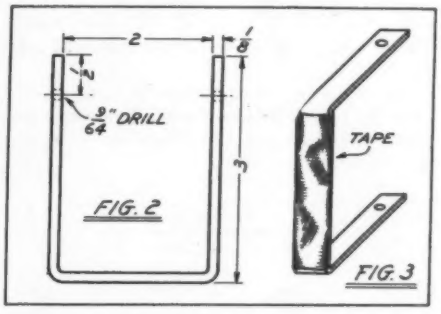
The base of the motor is made of a 1 by 3



Simple electric motor

by 2½ in. piece of sugar pine or other soft, workable wood. Chamfer one pair of edges as shown in Figure 1. Sandpaper the base until it is smooth and then give it a coat of lacquer or varnish.

The field core is made of ⅛ by ⅜ by 8⅛ in. band iron. Drill a 9/64-in. hole, ½ in. from each end, for the holding-down screws. With the help of a vise bend two legs, 3 in. long, at right angles to a 2-in. crosspiece which is left between them. (See Fig. 2.)



Round off the sharp corners off the crosspiece with a file, and lay pieces of friction tape along the crosspiece, as shown in Fig. 3, so as to completely insulate the winding which is to be placed there.

The winding takes 20 ft. of No. 22 S.C.E. magnet wire. A good way to wind this on the field core is to attach one end to a hook in a wall, or to some other fixed object that can be pulled against as the winding proceeds. To begin, keep 8 or 10 in. of the wire clear of the coil for connection purposes and, standing away from the wall, wind the wire on top of the friction tape. This is best done by turn-

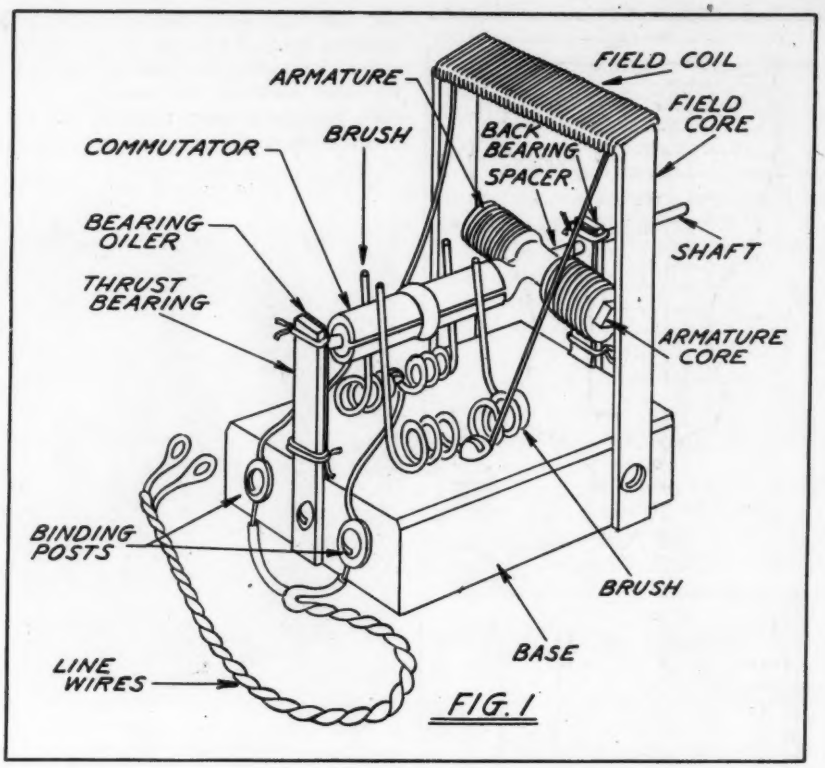


FIG. 1

ing the legs over and over while holding the core in the hands as shown in Figure 4. Wind three layers of wire in this way, each turn of the wire being close to its neighbor. Keep the wire tightly stretched.

Having finished the third layer tie a clove hitch or double knot in the last turn and, again leaving about 8 in. for connection, cut off the surplus wire.

The coil should be tested for an *open*, and also for a possible *ground*.

The field magnet is now ready to be fastened to the base as shown in Figure 1, with two No. 6 by ¾ in. r.h. blue wood screws. Place it ¾ in. from one end of the base.

The shaft for the armature is made of ⅛ by 4 in. round Bessemer rod. Care must be used in cutting off this piece as it must not be bent.

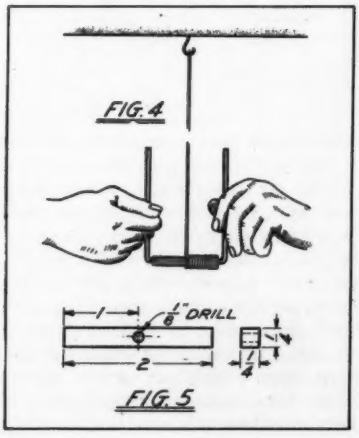


FIG. 5

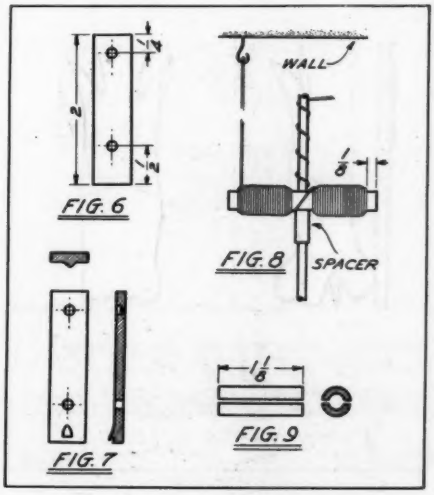


FIG. 6 FIG. 8 FIG. 7 FIG. 9

The core of the armature is made of a piece of ¼ by ¼ by 2 in. band iron. As the armature revolves at high speed it should be well balanced on the shaft. Therefore, the shaft hole in the armature core should be drilled truly central. (Fig. 5.) Push the shaft through the hole until 1¾ in. shows on one side of the core. To permanently fix the core in this position, lay the assembled pieces on an anvil. With a center punch and hammer bind the shaft by indenting the core opposite the shaft. Punch one side of the core; turn it over and punch the other.

The bearings in which the shaft is to run are fabricated from two pieces of ⅛ by ½ by 2 in. band iron. One of these pieces is seen in Figure 6. The finished pieces will be the same, except that one of them is a thrust bearing. Stop the drilling for this bearing hole before the drill goes through. In this way metal will be left in the hole to take the end thrust of the shaft. (See Fig. 7.)

These bearings are fastened to the shaft with No. 6 by 1 in. r.h. blue wood screws. Fix each piece centrally, with the bearing holes at equal heights above the base. In order that they will remain upright when fixed with a single screw proceed as follows: Fix one of the pieces in the vise with the foot up. Then, with a hammer and diamond-point chisel, chip the foot so that a piece of metal will project and engage the wood. Of course, the projection will be made on the side that will face the base. Figure 7 shows the thrust bearing after being prepared in this way.

The armature is to run freely and centrally between the field core legs, without touching at any point. To attain this end, fix the plain bearing first and put the long end of the shaft through it. Then temporarily erect the thrust bearing and, with the end of the shaft in it, judge if it is to be shortened at that end. Grind a piece off the shaft if necessary. Now, with the armature in its bearings, fasten the bearing pieces to the base in the position that gives complete freedom of rotation. (See Fig. 1.)

It will be noticed that the shaft is free to drop out of the thrust bearing. To stop this make a washer or sleeve out of thin sheet brass or steel. Cut a piece wide enough to encircle the shaft and long enough to fill the space between the armature and the bearing. Bend this piece around the shaft with pliers. (See Figs. 1 and 8.) The revolving member can now be worked in by turning rapidly with the shaft in a hand drill. Oil the bearings.

Take the armature off and insulate it in the same way as was done in the case of the field core. In this case, however, holes will have to be cut in the tape where the shaft interferes with the neat arrangement of the tape.

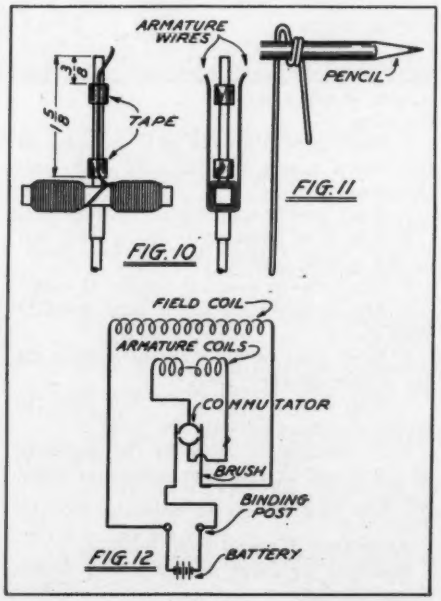


FIG. 10 FIG. 11 FIG. 12

For the winding, 20 ft. of No. 24 S.C.E. magnet wire will be required. Wind this, using methods similar to those used with the field core winding. Wind about 5 in. of the wire around the shaft and wind on the core out from the shaft by turning the piece in the fingers thus taking up on the stretched wire as the winding proceeds. Do not wind close to the shaft. (See Fig. 8.) About ⅛-in. from the end of the armature stop the first layer and turn the wire back over the last turn ("bank" winding) so that the second layer can be laid over the first without slipping. Wind four layers on this side of the shaft before crossing over to the other side and winding that in the same direction and with the same number of layers. Thus the fourth layer finishes at the shaft. Tie the wire here as was done with the finishing end of the field winding. Also electrically test this coil as in the case of the field coil.

The ends of the armature coil connect to the sections of a commutator. Make the commutator by splitting lengthwise with a hack saw a piece of ⅛-in. (iron pipe size) brass pipe 1⅛ in. long. This operation should leave two equal pieces. (Fig. 9.) Have them clean, inside and out. Use a file or rub with emery cloth.

To carry the pieces on the shaft, tear a 4½-in. piece of friction tape in half lengthwise and wrap the halves on the shaft in the locations indicated in Figure 10. Build the wrappings up tightly until they just fit inside the brass sections. Looking at Figure 10, note carefully the placing of the terminal wires with respect to the armature. This relation is preserved in placing the commutator sections over the wires. The wires lie centrally in the sections. With the terminal wires bare and clean, assemble the sections by tying them in place with a piece of knotted twine around the middle.

The brushes for the commutator are made of No. 18 bare copper wire. The brush springs are formed with the brushes. Each brush takes a piece of wire 10 in. long. Bend the piece in half, and then (see Fig. 11) lay a lead pencil near the bend and turn the wires back, one at a time, around the pencil. Make three full turns in each case. The finished brushes are held to the base, and in contact with the commutator, by a No. 6 by ½ in. r.h. brass wood screw with the head gripping the bend in the wire. Fasten them symmetrically on the base and adjust the springs so that all four upright wires bear equally on the commutator. (See Fig. 1.)

Arrange to have pieces of felt carry oil to the bearings. To do this cut a piece of ⅛ by ⅜ by 1¼ in. felt, and tie it with twine to the inner side of a bearing. The upper ends of the felt strips are split so that they contact the shaft on both sides. Tie the ends around the bearing, above the shaft. Treat both bearings in this way. Put a drop of oil on the felt. These oilers are seen in Figure 1.

On the front face of the base fix two No. 6 by ½ in. r.h. brass wood screws (with two No. 6 brass washers) — one on each side of the thrust bearing. These are the binding posts for the line wires.

To wire the assembly, follow the wiring diagram in Figure 12. One of the field-coil terminals goes to a binding post and the other to a brush screw. The armature terminal wires are already attached to the commutator. Finally connect the binding post to the vacant brush screw, and attach a line wire to each binding post. Use 5-amp. fuse wire for brush to binding post connection; for the line wires No. 18 annunciator twisted pair wire. Finish the line wires with suitable terminals. (See Figure 1.)

If the parts of the motor are lacquered or painted in contrasting colors, with the base as a background, the general effect will be good. The colors may be brushed on, or the part removed and dipped in the medium.

The armature has a dead center in the horizontal position. The motor may not start for this reason, but a slight touch of the finger on the armature will send it off. Put a drop of oil on the commutator at each contact point.

A GREEN HERON FOR THE POOL

Hazel F. Showalter, Davenport, Nebraska

One-inch white pine is the most practical material for cutting out the body of the green heron. The only other material needed for making the bird is two lengths of ¼-in. round iron, 12 in. long.

Bend the rods slightly about 2 in. from one end to make the knees of the bird. Bore slanting holes in the edge of the wooden shape of the bird to receive the ends of the rods.

The heron at the pool

To fasten these rods in the holes use a mixture of whiting with either lacquer or waterproof glue or use a ready-prepared plastic material. The lower 7 in. of the legs should be set in the ground to hold the bird upright.

The crest on the head of the heron, his body, and his wings are dark green. The remainder of his head and his neck and chest are dark brown. This does not include his bill and a small space around his eye which are yellow, nor the tiny white spot under his bill. For the finishing touches, make his legs brown, mark the edge of his wing with a very dark green line, and indicate the long plumy feathers that fall down over his back with strokes of green that are slightly lighter than the color of his back.

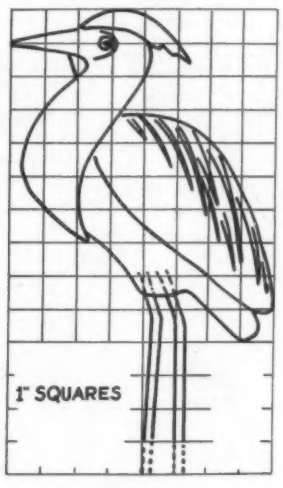
The heron will look his best if placed against foliage.

A MINIATURE CLIPPER SHIP

Gordon Rietveld, Milwaukee Country Day School, Milwaukee, Wisconsin

Here's a miniature, which when completed, makes a fine fireplace piece or when placed on a suitable shelf gives atmosphere to the old den. All that is needed is a few odd cutting tools, some sandpaper, a spool of No. 30 white thread, a spool of No. 30 tinned wire, a small quantity of pine scraps, a short length of window cord, a tube of airplane glue, a handful of short brads, a few hours of tinkering time, and a little patience.

Beginning from the bottom and working to the top, the hull will be the first on the list. The hull is shaped from ⅝-in. pine as shown full size in Figure 1. The dotted line indicates the shape of the keel side of the hull. Much can be added to the beauty of the hull by selecting stock with a beautiful grain. The deck surface is pitched slightly with sandpaper, and in addition, deck boards are scribed ⅛ in. apart, running from bow to stern. These are indicated with any sharp pointed tool used with a trisquare. The deck cabin is cut from ¼-in. pine to the size shown in Figure 1. Holes are drilled with a ⅛-in. drill to a depth of ⅛ in., to accommodate the main and aft masts. Holes are drilled on ½-in.



Layout for heron

centers, for the deck rail to the depth of ⅛ in. A ½-in. brad fitted into a hand drill will work satisfactorily for this purpose. Small wire loops are shaped by twisting No. 30 tinned wire around a ⅜-in. brad and clipped short at the same height, then placed in position as shown in Figure 2. The bow sprit is shaped from ⅛-in. pine rounded smooth with sandpaper and tapered to 1/16 in. at the tip. The small strut, slightly tapered, 1/16 in. in diameter, is then glued into place. A hole drilled in the bow sprit will make the fitting more satisfactory. The bow sprit is glued to the deck surface after being sanded to the proper angle.

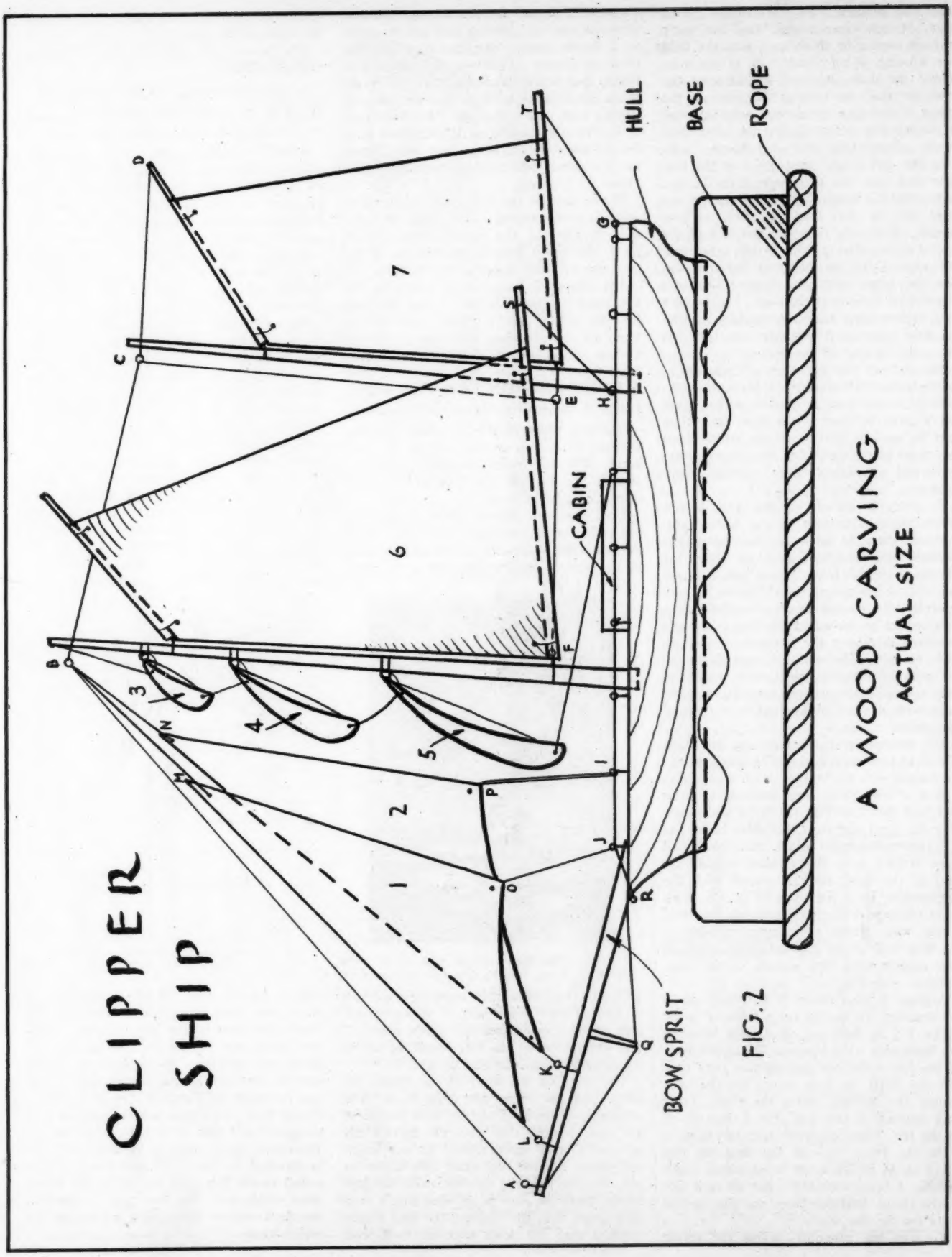
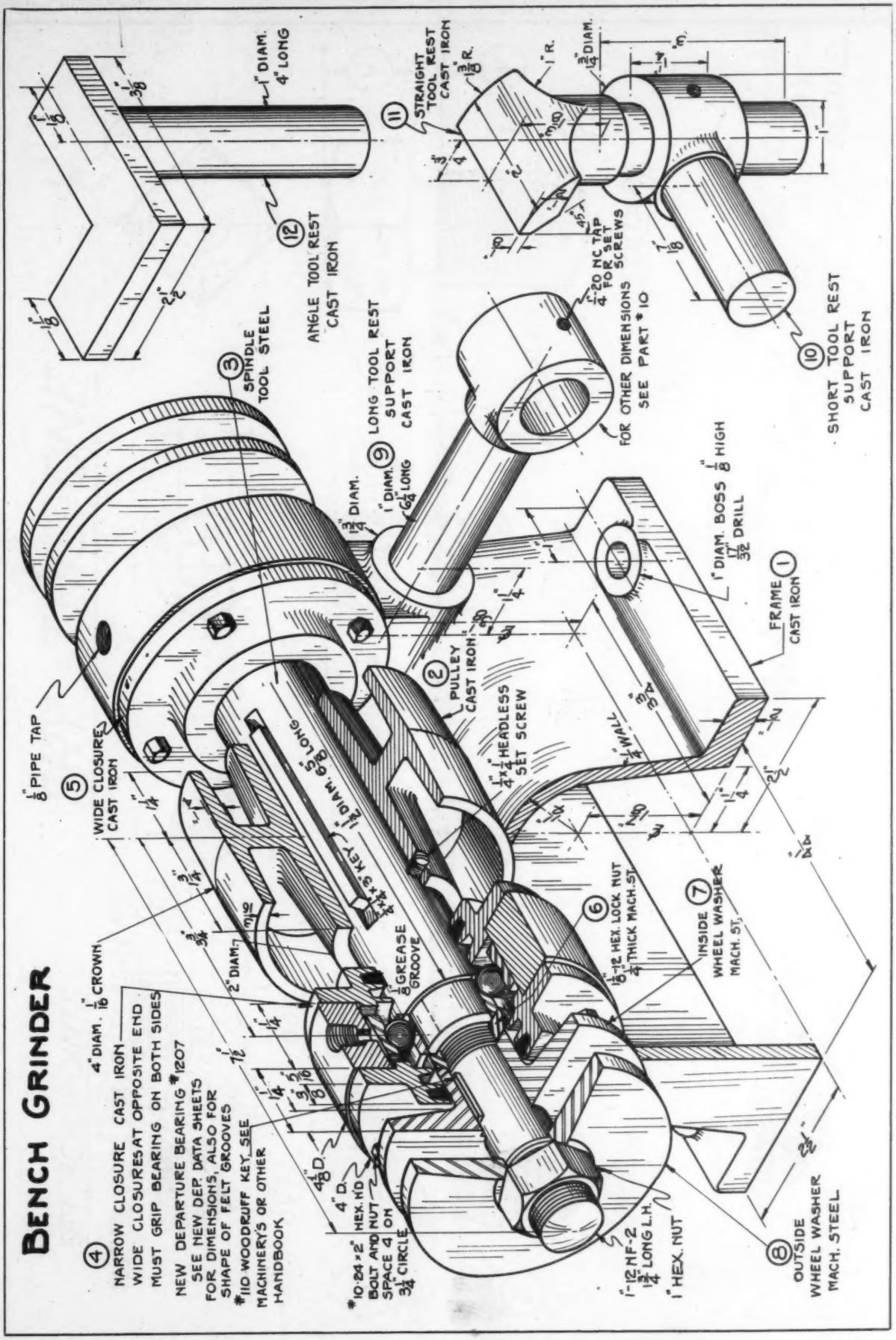


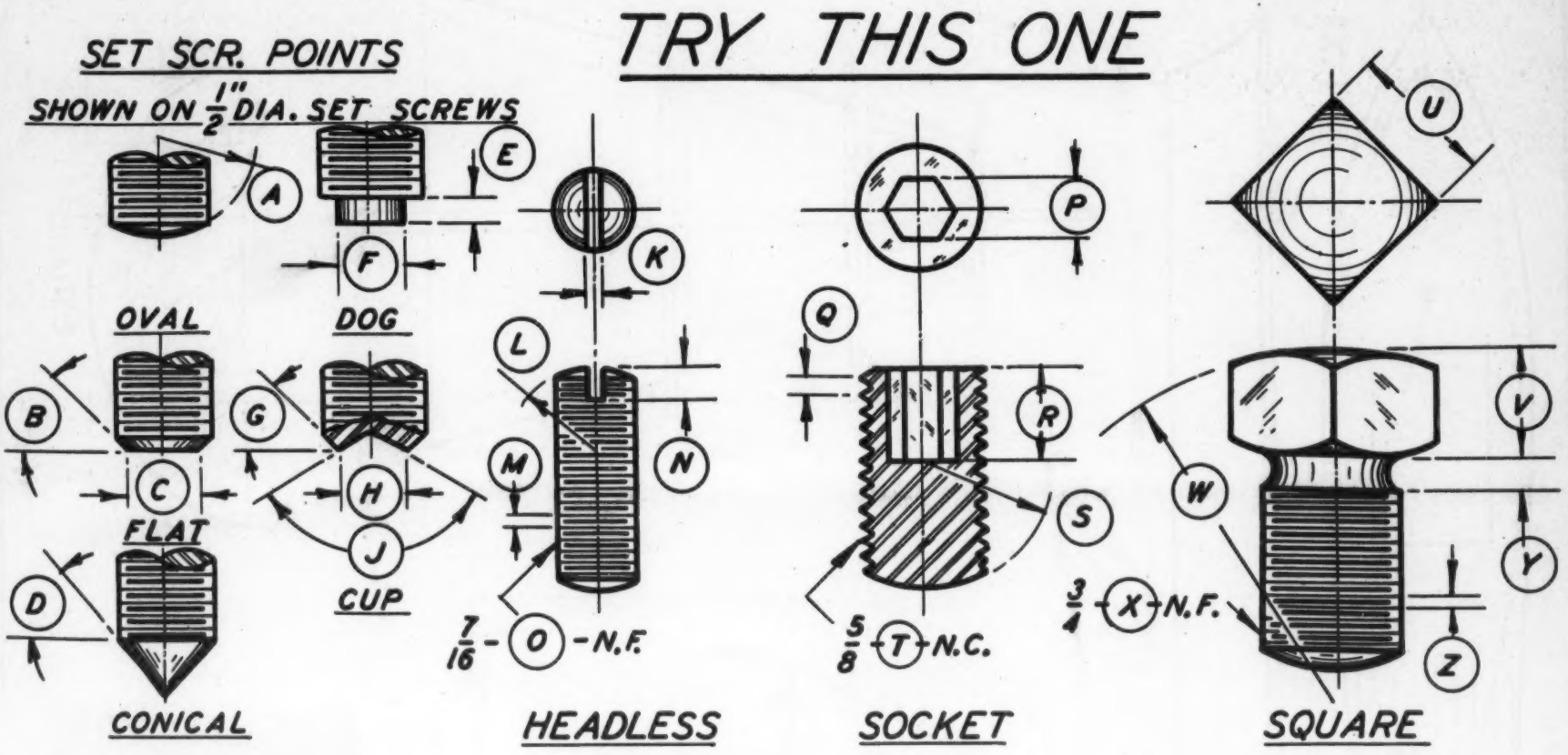
FIG. 2

Miniature clipper ship submitted by Gordon Rietveld *(article continued on page 205)*


BENCH GRINDER
4 NARROW CLOSURE CAST IRON
WIDE CLOSURES AT OPPOSITE END
MUST GRIP BEARING ON BOTH SIDES
NEW DEPARTURE BEARING #1207
SEE NEW DEP. DATA SHEETS
FOR DIMENSIONS, ALSO FOR
SHAPE OF FELT GROOVES
#110 WOODRUFF KEY, SEE
MACHINERY'S OR OTHER
HANDBOOK
4" DIAM. 1/16" CROWN
5 WIDE CLOSURE CAST IRON
1/8" PIPE TAP
3 SPINDLE TOOL STEEL
2 PULLEY CAST IRON
1/4" HEADLESS SET SCREW
1 FRAME CAST IRON
1" DIAM. BOSS 1/8" HIGH
17/32" DRILL
9 LONG TOOL REST SUPPORT CAST IRON
1" DIAM. 6 1/4" LONG
1 3/4" DIAM.
FOR OTHER DIMENSIONS SEE PART #10
10 SHORT TOOL REST SUPPORT CAST IRON
11 STRAIGHT TOOL REST CAST IRON
1" R.
1 3/4" DIAM.
12 ANGLE TOOL REST CAST IRON
1" DIAM. 4" LONG
6 1/2-12 HEX. LOCK NUT 1/4" THICK MACH. ST.
7 INSIDE WHEEL WASHER MACH. ST.
8 OUTSIDE WHEEL WASHER MACH. STEEL
1"-12 NF-2 1 3/4" LONG L.H.
1" HEX. NUT
#10-24 x 2" BOLT AND NUT SPACE 4 ON 3 1/4" CIRCLE
4 1/8" D.
4" D.
1/8" GREASE GROOVE
1/4" x 3/4" KEY
1 1/2" DIAM. 8 3/4" LONG
2" DIAM.
1/4" WALL

Submitted by W. A. De Vette, Wilson Junior High School, Erie, Pennsylvania. *(See description on page 196)*

TRY THIS ONE

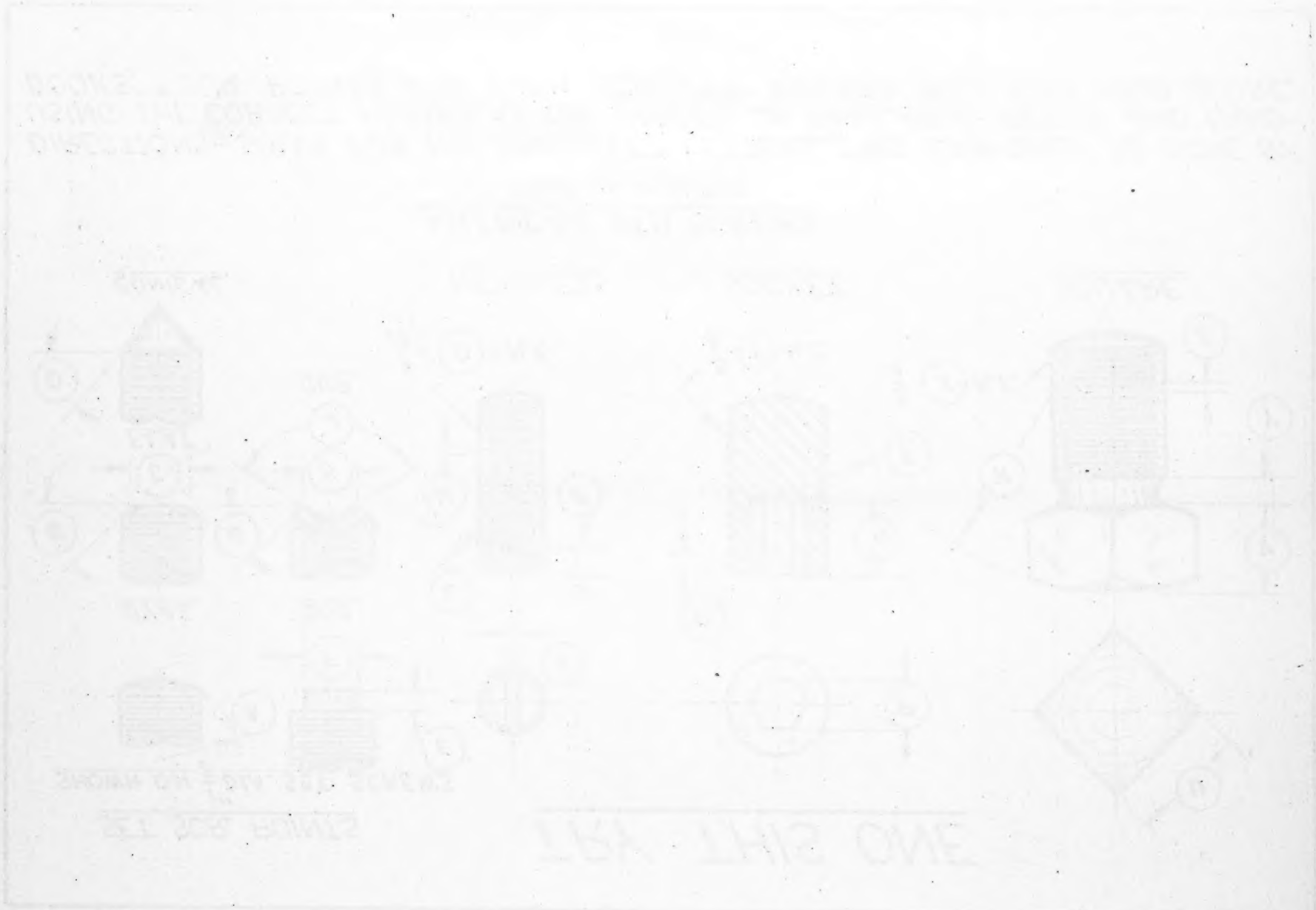


AMERICAN STD. SCREWS

TIME-20 MINUTES

DIRECTIONS—SOLVE FOR THE ENCIRCLED LETTERS. THIS CAN ONLY BE DONE BY USING THE CORRECT FORMULAS OR TABLES IN AVAILABLE TEXTS AND HAND-BOOKS. FOUR POINTS FOR EACH CORRECT ANSWER WILL GIVE YOUR SCORE.

Submitted by Charles Quinlan, Jr., High School, Stratford, Connecticut



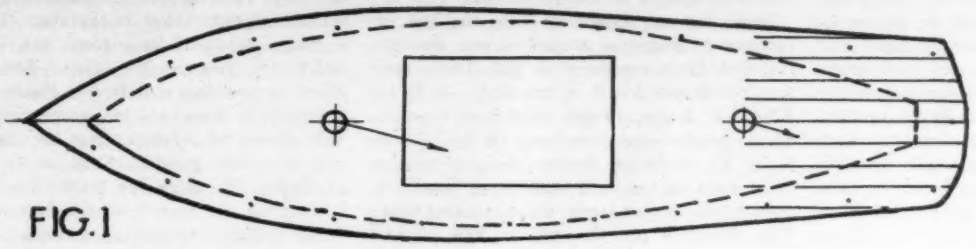


FIG. 1

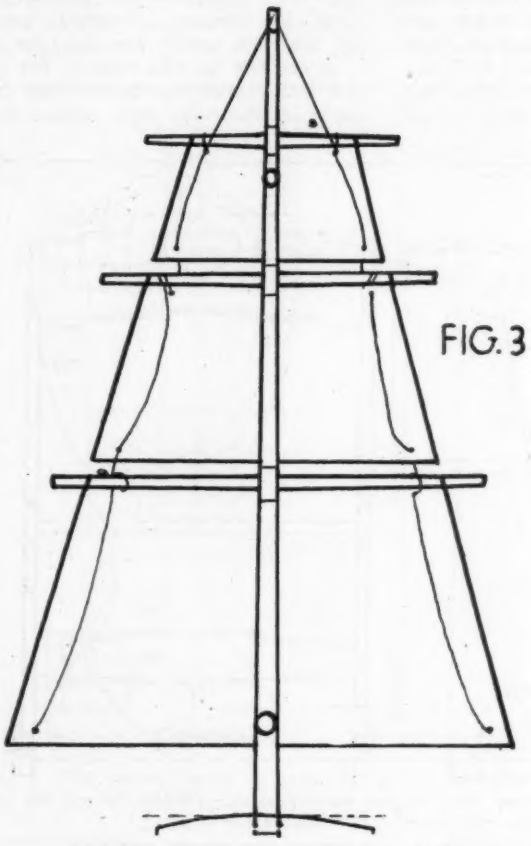


FIG. 3

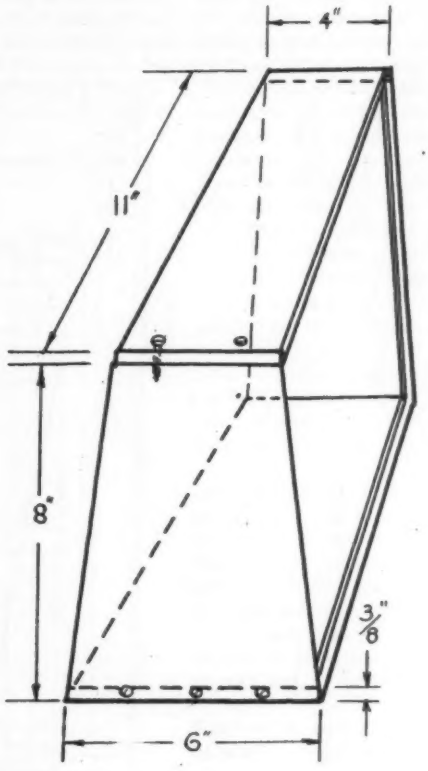


FIG. 5

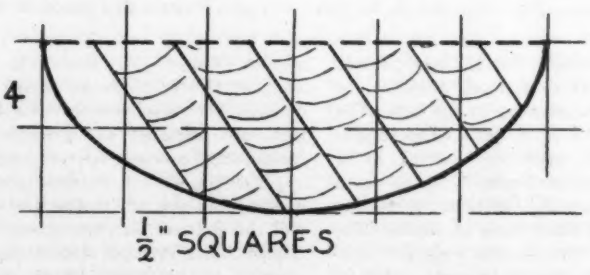
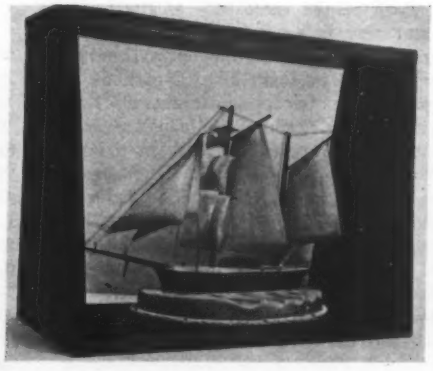


FIG. 4



Details of miniature clipper ship *(continued from page 200)*

The masts, are rounded from ⅛-in. pine and tapered to 1/16 in. at the top. They are then cut to the size indicated in Figure 2, and are fitted and glued into the holes cut previously. The two booms and two spars for the main and aft sails are made of 1/16-in. pine rounded, tapered, and shaped to size. Match sticks will be suitable for the short ones. Spars for the three square sails can also be shaped from match sticks. If the builder wishes, he may sand a long strip and later cut off the desired lengths.

All of the sails shown in Figures 2 and 3 are actual size. They are the fore jib 1, aft jib 2, main mast square sails 3, 4, and 5, main sail 6, and aft sail 7. The beauty and charm of the ship lies in the wood-carved sails which have a wind-blown appearance, for they are convex as well as concave. The carving can be done entirely by hand with the use of a half-circle carving tool and a razor blade. It is immaterial which side is carved first, but regardless of choice, extreme care should be taken to insure an even cut. An oilstone kept handy and used often to sharpen the tools is good insurance against splitting and rough cuts. Both with-grain and against grain-cutting is required, so it is suggested that the longest portion of the sail be laid out with the grain. In carving the concave side, the cutting runs toward the center of the sail where the finished thickness, after sanding, should be slightly less than 1/16 in. The convex side may be roughly trimmed to a thickness of a little more than 1/16 in. when finished with sandpaper. Each of the sails is finished in this manner.

The top surface of the deck as well as each of the sails is given three coats of shellac. A coat of maple stain is given to the bow sprit, hull sides, masts, booms, spars, and cabin.

Small holes are drilled ⅛ in. from the edge at each corner of the main and aft sails in order that the spars and booms may be wired to them. Small loops turned tightly and clipped short are used, then turned under on the concave side. The three square sails on the main mast are next in line. Small holes are again drilled at the four corners of the sails, and one spar is wired to the top of each sail.

The two holes at the bottom of the sail are to be used later when rigging. Then at the positions indicated on the main mast, the spars are wired in place with a U-shaped loop. Each of the three sails is attached in the same manner, but before each is tightened, the sails are placed at the angle shown in Figure 2. Drill a small hole at each of the three corners of the triangular jib sails 1 and 2 to be used for rigging. Wire loops are placed at the three positions indicated on the bow sprit and at the positions on the main and aft mast, at *F*, *B*, *C*, and *E*.

The boom as well as the spar on each of the masts is fastened to the mast by a wire loop, the twisted end of which is centered in a hole drilled in the mast side of the spar or boom. After these sails are attached to the masts, both are placed at a wind-blown angle as shown in Figure 2, by arrows.

Rigging the ship is a simple procedure; a spool of No. 30 white thread and a short length of wire is all that is needed.

Beginning and ending at *R* at the bow, a continuous length of thread is run through the deck loops for the deck rail. Then from *R* a continuous length is run to *Q*, *A*, *B*, *C*, *E*, and *F*. A short length runs from *C* to *D*. Short lengths also run from *H* to *S* and *G* to *T*. A thread tied to the top of the main mast is run in a continuous length in rigging the square sails to the main mast. The thread is put through the hole on the convex side at the top, brought under and over the spar, extended the length of the concave side, and then put through the hole at the bottom of the sail. From this point the thread continues to the rigging of the other two sails and is tied to the deck rail as shown in Figure 2. Both sides of the sails are rigged in the same manner. The fore jib 1 is rigged at *L* and *M* to *B*, and also from *O* to *J*. The aft jib 2 is rigged to the bow sprit at *K* and *N* to *B*. A short length of wire runs from *P* to *I*, and supports the fore jib as well as gives a wind-blown angle to both sails.

Figure 4 shows the plan for the carved base. The ship is centered along the dotted line and the keel side is outlined. This outlined portion is cut out (Fig. 2) to a depth of ⅛ in. to allow for the ship being set in the base. The pine used should be ¾ in. thick. The suggestion of waves is made by carving along diagonal lines shown in Figure 4, to the depth indicated in Figure 2. The base is sanded smooth and given three coats of shellac. The ship is placed in the cut-out area and held tight by two ¾-in. flathead screws, countersunk, from beneath.

The case shown in Figure 5 is optional. However, the ship does accumulate a certain amount of dust if left in the open. The case is made of ⅜-in. mahogany, the sides of which are grooved for glass. Ten screws placed at positions indicated in Figure 5, hold it together. Brass 1¼-in. screws look quite well. Pieces of window glass are cut to fit into the side grooves. Four or five coats of shellac are given for finish. The base is screwed to the case from the bottom, using ¾-in. flathead screws, countersunk.

A nautical appearance is given the base by placing a short length of window cord around its circumference. This cord is held in place by small escutcheon pins.

INTRODUCTION TO WOOD-WORKING MACHINES

E. H. Grosskopf, Boys' Technical High School, Milwaukee, Wisconsin

The two projects described are not only neat and useful, but they also serve as an excellent teaching vehicle. The pupils have had considerable layout work before coming to these two type projects in our regular course of study in woodwork. Templates are used in laying out these designs. The objectives in these two projects then, are primarily to introduce simple but fundamental machine operation and processes.

1. Getting out the material involves the use of the cutoff saw, the ripsaw, the crosscut saw, and the jointer. The production of pieces of duplicate and multiple widths and lengths are stressed at this stage. Pieces are also glued up to get required widths.

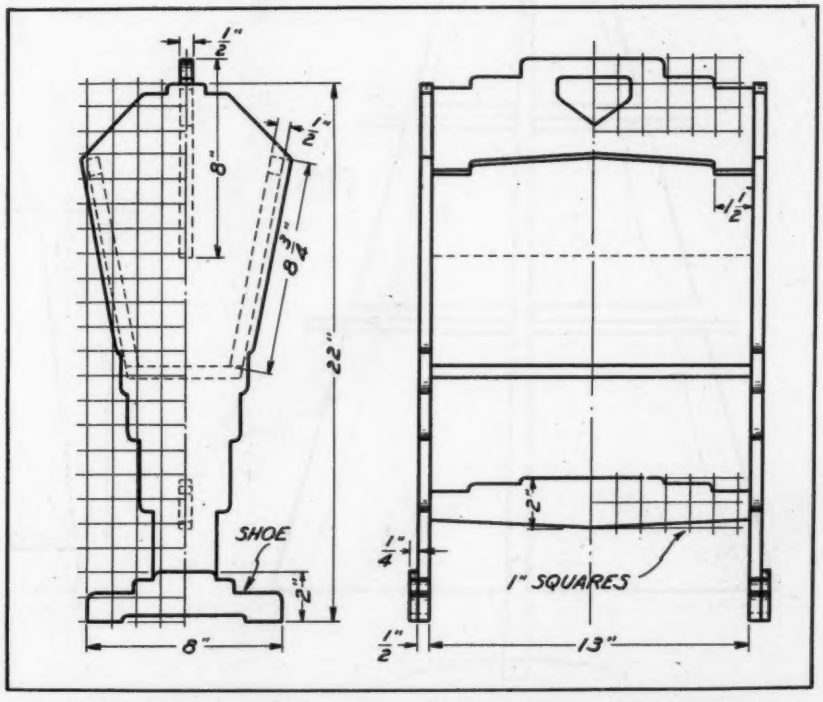


Fig. 1. This magazine holder is a very suitable project for junior or first-year senior high schools. It is made of basswood and is assembled with No. 16 by 1¼ in. brads. The shoes are ¼ in. thick and are bradded and glued to ends

2. Surplus glue is removed where necessary. Surface planing may also have to be resorted to, in order to obtain proper thicknesses.

3. The band saw is used in cutting out the various shaped pieces. Stress is laid on the proper and safe use of this saw.

4. Preparation for assembling is then made. The location of each piece is laid out on the inside of the ends. Pilot holes for the brads are then drilled after which the various pieces are finally assembled.

5. Finishing with lacquer or enamel is then demonstrated by the instructor, after which each boy selects his own color scheme and finishes his project. Transfers may be added to supplement the ordinary trimming.

There are other objectives, such as the development of skill in the handling of various hand tools, accuracy, conservation of materials, and the like, which most every project offers, but as a vehicle to introduce simple and fundamental power-machine work, these two type projects have proved very satisfactory at our school.

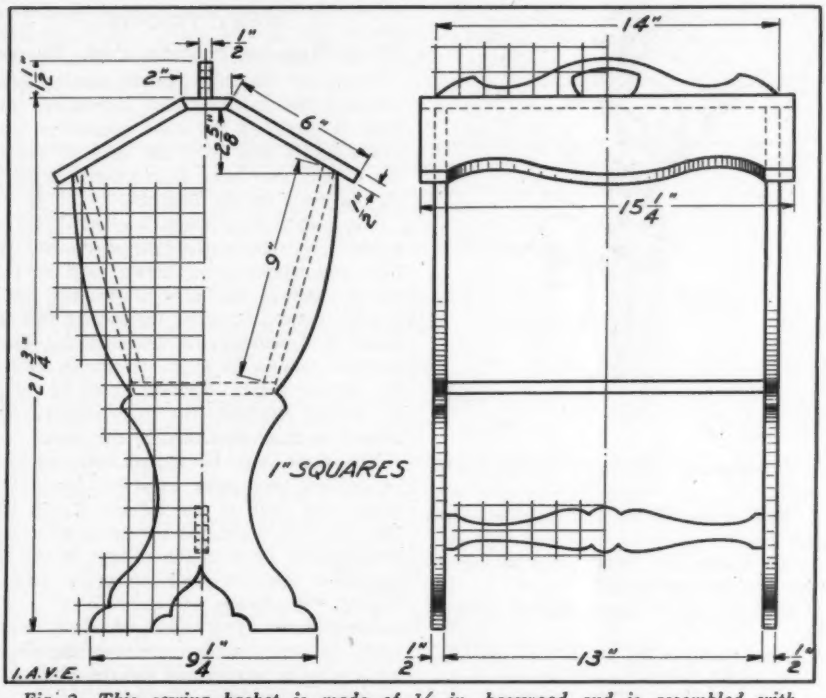


Fig. 2. This sewing basket is made of ½ in. basswood and is assembled with 1¼ in. No. 17 brads. The covers are hinged with clover leaf hinges. A tray may also be made to fit inside the basket

BLACKLINE DEVELOPING

Leslie H. Murphy, Ottawa, Kansas

Blackline developing is a process which makes black lines on a white background. This process has many advantages over blueprinting. In order to produce a blueprint with a white background a Van Dyke must be made first on a very thin paper. After this is developed and dried, it is then used as a negative to print from. In the blackline printing the prints are made directly from the tracing. If it is necessary to make alterations or corrections on a blueprint, the regular drawing instruments or a writing pen are used with a solution of soda and water or quicklime and water which has a bleaching action and will produce white lines. On a blackline print the corrections or alterations can be made with pencil or drawing ink. The blackline prints are used by the U. S. Soil Conservation Service for their maps and engineering prints. They are used because changes can be made in pencil out in the field and serve as a work map. Also the sun has no effect upon the print while the blueprint will fade if left out in the sun.

The blackline paper can be obtained from any of the large drawing supply houses. It comes in 30-, 36-, and 42-in. widths, and in rolls containing 10, 25, 50, or 100 yds. In order to develop a blackline print a special solution must be used. There are several brands of blackline paper and each brand has a special developing solution, which comes in the form of salts. There are two different kinds of powder which must be kept separate. When ready to be used, the powders are mixed with the amount of water specified on the can. It is not advisable to mix up all the solution at once as it deteriorates with age. Therefore, divide the powder into halves or fourths and mix up that much solution at a time. In mixing the solution put the powder in a graduated glass beaker and add the given amount of water and stir with a wooden spoon. When all the powder is dissolved, pour the solution in brown bottles and keep in a dark place.

Blackline printing differs very little from blueprinting. First the tracing is placed in the printing frame, the inked side toward the glass. On the tracing, place a piece of blackline paper a little larger than the drawing with the sensitized side next to the tracing. Then place the felt pad on the blackline paper, put on the cover and clamp the whole down with the springs. The print is then ready to be exposed to the sun. The time of exposure in bright sun varies from 25 seconds to 50 seconds depending upon the season. With this as a basis place the frame out in the sun and make the exposure 35 seconds. The print is then ready to be developed. First pour out some developing solution in a deep crockery dish. Next take the blackline paper out of the frame and lay it on the table with the sensitized side up. This should be done in a fairly dark room. Then with a sponge apply the developing solution. The solution develops the blacklines where the ink on the tracing prevented the sunlight from penetrating. Wherever the sunlight has touched the paper, the print will be white. Then place the print under running water to wash off the developing solution. If this is left on, the print will turn brown in time. If the proper exposure is made, lines will be black and the background, white.

If the lines are light gray, the print has been overexposed. If the background is dark, it has been underexposed.

TWO WINDMETERS

William J. Becker, General Metal Instructor, Junior High School, Ithaca, New York

The smaller size windmeter described herewith may be made and used for a bicycle decoration. The larger size may be mounted on the house, barn, or fence.

Materials

Small Windmeter		
1 pc. 4½ x 4½		Tinplate
1 pc. ½ x 2½		Dowel
1 pc. ½ x 4	x 1/16	Wrought iron
1 pc. ½ x 7	x 1/16	Wrought iron
Spinner		
Spacer		
Support		
Clamp		
Large Windmeter		
1 pc. 8¾ x 8¾		Tinplate
1 pc. 9½ x ½ x	⅛	Wrought iron
1 pc. ½ x 4	x 1/16	Wrought iron
Spinner		
Spacer		
Support		

Directions

Spinner

1. Make out bill of material and have instructor approve.

2. Cut out materials as listed.

3. Using pattern of spinner, trace outline as in Figure 2.

4. Cut outline as in Figure 2. Use straight snips and cut lines in following order: Curves A, straight B, straight C.

5. Draw lines as in Figure 3. Center punch for hole at O. Punch through with a No. 9 solid punch on a wood block.

6. At dotted lines in Figure 3, bend all curved parts down sharply at a 90-deg. angle, as shown in Figure 4. See instructor.

7. Form cones with small pliers as in Figure 1. If necessary, ask the instructor for

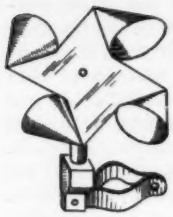


FIG. 1

FIG. 2

help. Test on pattern obtained from the instructor.

8. Solder inside junction of cone ends. *Joints must be tight* before attempting to solder.

Spacer for Small Windmeter

1. Cut a piece of ½ by 2½-in. doweling. Square and smooth ends.

2. Locate centers of both ends. With hand drill, drill a No. 34 hole about ½ in. deep. See instructor.

Spacer for Large Windmeter

1. Grind both ends of stock round, using power grinder.

2. Lay out holes as in Figure 5.

3. Center-punch and drill all with a 3/16-in. drill. Smooth off all burrs.

Support (Same for large and small models)

1. Square up both ends of piece, using file. See Figure 6.

FIG. 5

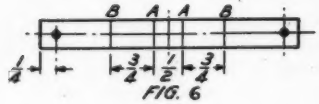



FIG. 6

2. Lay out lines in Figure 6 in following order: Center line, B, A, and all holes.

3. Center-punch hole locations and drill with a 3/16-in. drill. Use a power drill press if possible.

4. Clamp in vise and bend along line A as in Figure 7.

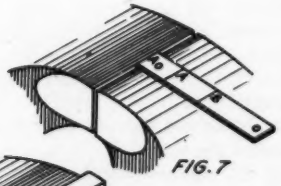


FIG. 7

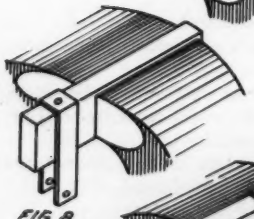


FIG. 8

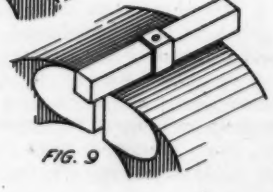


FIG. 9

5. Clamp ½-in. bar in position as in Figure 8. Bend piece as shown.

6. Place ½ by ½-in. block in place and squeeze into position as shown in Figure 9.

Clamp (No clamp needed for large model)

1. Round off both ends of the piece on a power grinder. See Figure 10.

2. As in Figure 10, lay out lines in the following order: Center line, A, B, and holes.

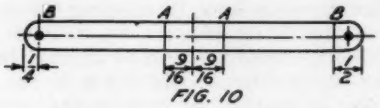



FIG. 10

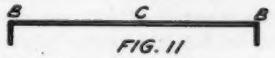


FIG. 11

FIG. 12

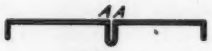


FIG. 13

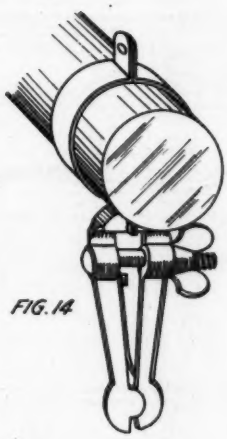


FIG. 14

3. Center-punch holes and drill with a 3/16-in. drill.

4. Bend on lines B so ends are down as in Figure 11.

5. See Figure 12. Bend piece double at center line. See instructor.

6. Drill hole C in Figure 12. Use 3/16-in. drill.

7. Bend down on line A so final job looks like Figure 13.

8. Clamp with hand vise as in Figure 14 and bend model over stake. When ends come close, put bolt through holes and finish rounding.

Assembly

1. Get nuts and bolts from instructor.

2. Assemble, using master model, and Figure 1 as a guide.

3. Clean project with steel wool.

4. If painting with more than one color, allow first coat to dry before applying second.

5. Submit to instructor for mark.

Questions

1. Upon what does the size of a solid punch depend? (Reference A, page 205, par. 4.)

2. "Mechanical drawing is the language of industry." What is the meaning of this statement? (Ref. A, page 6.)

FIG. 3

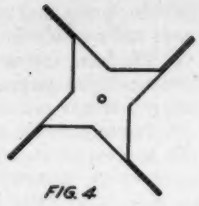


FIG. 4

3. Name four kinds of tin snips. (Ref. A, page 194.)

4. Metal parts to be soldered must be clean. Why? (Ref. B, page 123, par. 1.)

5. Mention one of the dangers encountered in handling sheet metals. How can it be lessened?

References

A. *School and Home Shopwork*, Schultz and Schultz (Allyn and Bacon, Boston, Mass.).

B. *Essentials of Metal Working*, Berg and Wing (The Manual Arts Press, Peoria, Ill.).

DART TENNIS

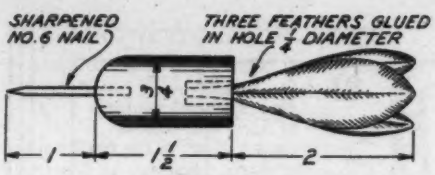
E. A. Rerucha, Franklin Park, Illinois

Young and old, and especially tennis players will find this game of skill interesting. The game is played in the same manner as lawn tennis except that darts are used instead of the rackets and balls. Instructions for playing are given on the blueprint.

The design of the court may be drawn on a piece of soft plywood or wallboard, the lines and figures being drawn with drawing ink or paint. If wallboard is used two pieces should be glued or nailed together so that the board is of sufficient thickness for the darts. Allow a margin of about six inches around the playing courts. A board about 22 by 29 in. will be required. The darts may be purchased or made according to the sketch.

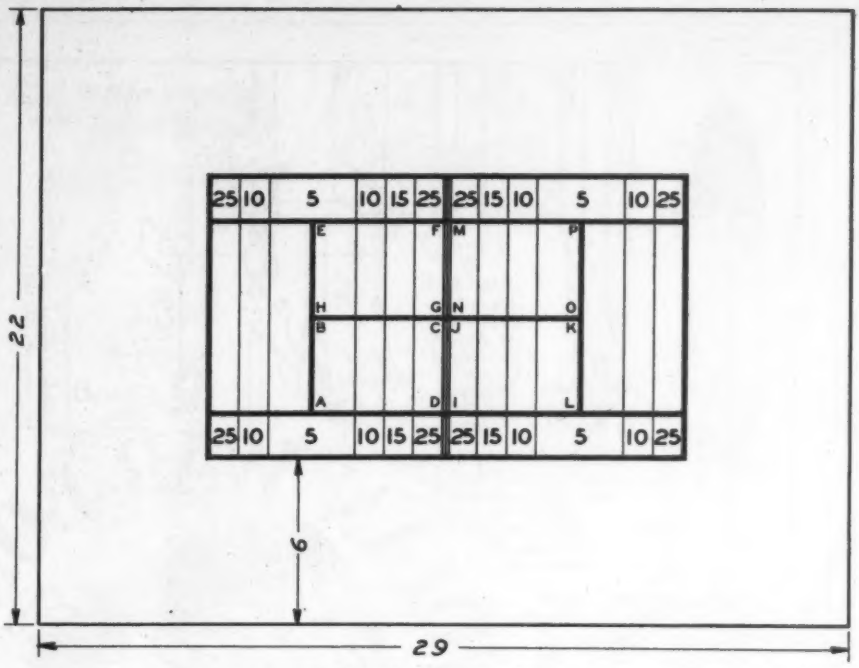
The game may be played both outdoors or indoors, thus being adaptable for parties, picnics, as well as for private family use. The board is suspended by means of a cord tied through holes at the corners at the top or stood upon a chair or other suitable support for playing.

DIRECTIONS: The rules of lawn tennis apply to dart tennis except that the winner of a play is determined by the placing of a dart in the highest numbered area in the proper court. Two or four players may play, taking turns in throwing the darts. Darts are thrown from a distance of about six feet, the players of each team taking positions in front of the board to the right and left of the net. Suppose two players are playing singles: player at right starts the game by serving a dart into the area *ABCD*. If the first dart lands outside this area or in the net, the second dart is thrown. If the second dart lands outside or in the net, this player loses the play and the score is one point for the opponent. Suppose, however, that the dart landed on *10* in the area *ABCD*. The opponent then takes his turn and throws a dart to the right of the net, within the boundaries of the single court, attempting to place a dart on an area numbered higher than *10*, that is,

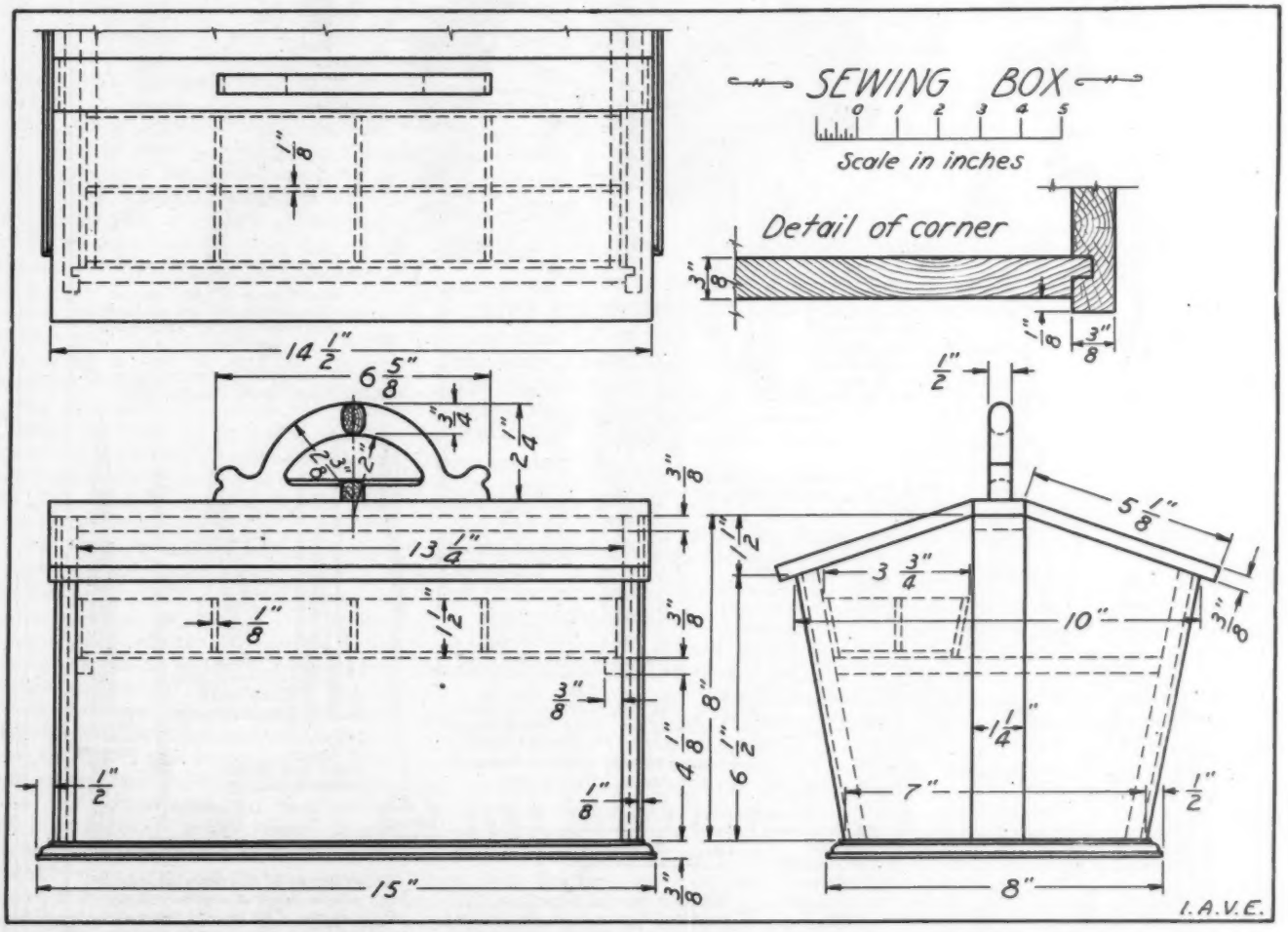


The dart

15, or *25*. Players thus take turns throwing darts into their half of the court attempting to equal or better the hit made by the opponent. Play continues until one player fails to equal or better the hit made by the opponent in the same number of throws. The next play is started by player at right serving into area *EFGH* and the opponent again attempting to place his darts on a higher numbered area to the right of the net within the single-court boundary lines. The player first scoring four points wins a game. If both tie at four points, two points must be won in succession to win game as in tennis. Players take turns at serving, that is, player at left starts second game by serving into area *MNOP*. Six games make a set and players change sides at the end of each set. Four players play in like manner taking turns at serving and throwing with their teammates.



Dart-tennis game board



Submitted by Carl v. Lindeman, Western State Teachers College, Paw Paw, Michigan

INDIAN WAR BONNET

PLATE BY W. BEN HUNT
HALES CORNERS, WIS.

1 Feather & Fluff

White feathers may be dyed at the tips to look like eagle feathers, with liquid shoe polish and a small brush. Completed feather at right was sketched from a real eagle feather.

2 Quill & how to cut it. Soak the end in boiling water first.

3 Bend end up and insert it as shown, placing a drop of Dupont cement on tip.

4 Cut tape

Adhesive tape

5 Start wrapping

6

7 Bind large fluff to outside of quill.

8 Complete tape wrapping

2"

9 Wrap with 2 inch square of red cloth, so that edge comes to the back of the quill and sew or fasten edge with Dupont cement.

10 Tie with yellow yarn as shown:

11 Now cement 2 strands of horse hair and a small fluff to the tip of each feather. Modern Indians sometimes use colored fluffs both at the tip and at the base of the feather.

Use white turkey or goose feathers. If roughened from handling, pass them thru steam & work smooth with fingers.

Bases of feathers may be beaded.

COMPLETED FEATHER

Single feathers made up like this may also be used as decorations on clubs, shields, tom-toms, war and arm bands. They should hang by a buckskin thong.

Crown of an old felt hat.

3/4 to 1"

1"

FRONT

5 1/2"

BACK

12 Cut two 1/4 inch slits 3/4 to 1 inch apart as shown above. This means about 29 feathers for a size 7 hat band at 3/4 in. & 23 at 1 in. apart.

13 Lace quills to crown starting with the best feathers at the center front and working both ways. Knot the ends of lace at the back.

14 Feathers are held in upright position by a waxed cord sewed thru the quills in the inside as shown at left. They may then be adjusted to suit the wearer.

15

MATERIALS USED:

About 30 feathers,
30 large & 60 small fluffs,
1/2 in. wide adhesive tape,
Tube of Dupont cement,
Some turkey red cloth or flannel,
Horse hair,
Yellow yarn or twine,
Crown of old felt hat,
Brown cotton or leather shoe lace, Buckskin thongs & some rabbit fur for side hangings,
2 metal disks and a Beaded head band.

The headdress is now sewed on. This band should be about 1 1/2 inches wide, and should project below the rim of the crown.

1 1/2" HEADBAND 2"

While a beaded headband is preferable, one with the designs painted on with enamel will look well if carefully made.

16 Disks & side ornaments are placed as shown in center, between the temple and the ear. Disks may be made of tin, brass or pewter, and are fastened to the crown at the top and sides. They should be highly polished.

17 Pendants, like those shown below, may be used singly or in combination.

Strips of short haired fur.

A cluster of brass cones will jingle when in motion.

Brightly colored fluffs tied with colored wool.

Horse hair pendant

Buckskin thongs with large colored beads.

Headdresses of feathers should be kept where mice & moths cannot get at them. The fluffs from the authors head dress made a warm lining for a mouse's nest one winter.

MAGNETIC INDUCTION

Harold Trelease, Principal, Essex County Boys' Continuation School, Bloomfield, New Jersey

Definition. The influence exerted by an electrified or magnetized body through a nonconducting medium without any apparent communication of a current.

Magnetism. There is every reason to believe that magnetism and electricity are but "modifications of one force."

It is necessary to have a clear conception of the *nature* of magnetism as it forms the most important basis of "things electrical." Magnetism and electricity are so closely linked together that the student will not get very far in a consideration of the one without having to express it in terms of the other.

Transparent Power. Were it possible to see the inside of a cylinder pertaining to a steam engine when the engine is in motion, there would be two parts visible to the eye; namely, the polished surface of the cylinder and the piston. The *power* applied to the piston making it move forward and backward in the cylinder could not be seen by the eye, thereby proving this power to be "transparent." This invisible or transparent power is "steam."

The curious force which is exerted by magnets whether weak or strong, permanent or electrically excited, is also a "transparent power," and is often spoken of as "magnetic lines of force," "magnetic flux," or "magnetic field."

The path or direction of these lines of force can easily be observed by laying a straight bar magnet on a table with a sheet of paper over it and sprinkling iron filings even on the surface. The filings will arrange themselves in such a manner as to indicate the *direction* of the magnetic flux or lines of force.

A magnetic field is also produced by the passage of a current through a wire or conductor. By placing the wire or conductor vertically through a piece of paper, allowing a current of electricity to flow through the wire, and sprinkling fine iron filings evenly on the paper, the lines of force will form circles concentric with the conductor. The direction of these lines of force bears a definite relationship to the direction of flow of the current in the wire. By changing or reversing the connection, the direction of the lines of force will be *opposite or reversed.*

Movement of the Magnet. By inserting the bar magnet into the coil, (see Fig. 1) the galvanometer needle will make a quick movement to one side and then return to zero. On pulling the magnet out, the needle will again move but in the opposite direction.

As the magnet used in this experiment lost none of its magnetism, the energy which propelled the current must have been derived from the movement of the magnet. It was the mechanical generation of a current by the expenditure of energy rather than any conversion of magnetism into electricity.

Alternating Induction. In the experiment illustrated in Figure 1, the inductive effect of plunging the bar magnet into the coil of wire is clearly shown. Inserting and withdrawing the bar magnet 60 times per second, would generate alternating currents having a corresponding frequency.

The elements of an alternator are thus a coil of wire and a magnet. The voltage and current are produced by causing the magnetism to sweep in and out of the center of the coil.

The Solenoid

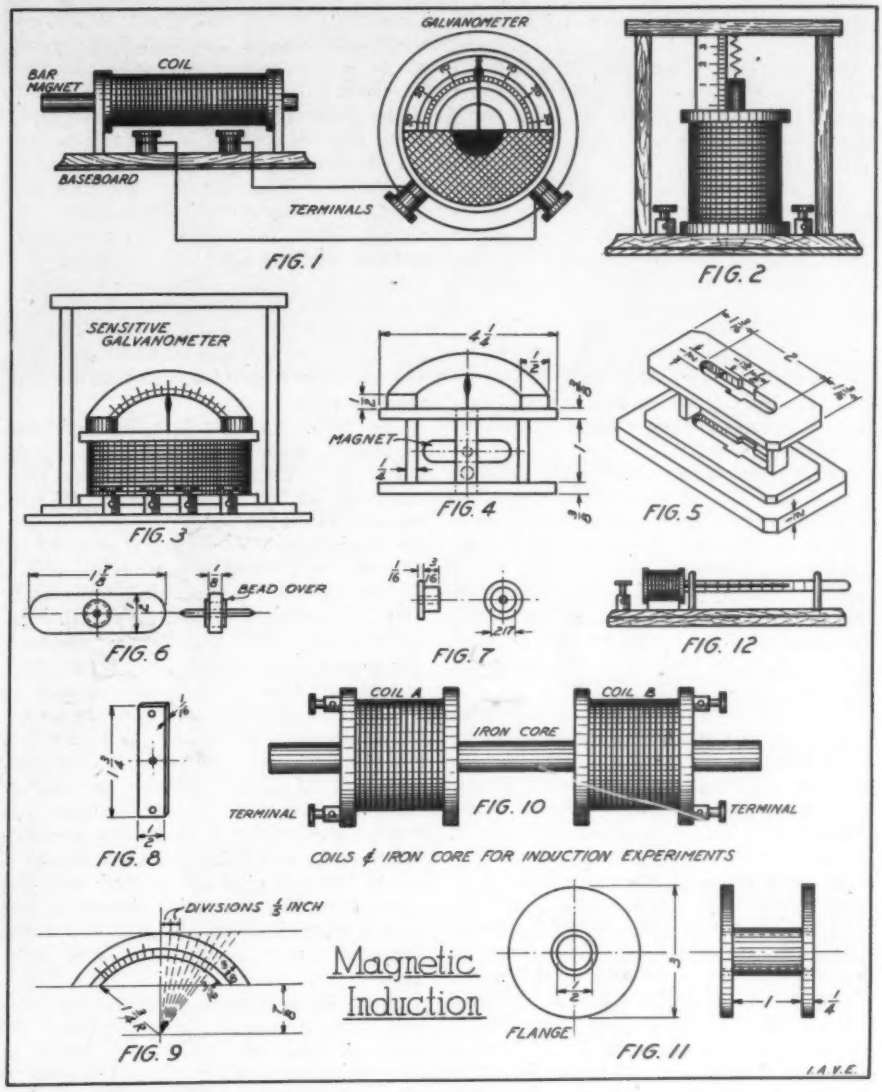
Definition. A solenoid is a coil of insulated wire wound on a nonmagnetic spool or bobbin. Its length exceeds or is longer than its diameter. A solenoid may have an air core or a movable iron core.

Magnetic Action. A coil of wire has of itself no magnetic properties at all. It will not attract or pick up pieces of steel or iron filings, nor act on a compass needle. By connecting it to a battery so that the current flows along the wire, and circulates around and around the core, it can be made into quite a powerful magnet which will pick up iron filings or pieces of steel. Immediately upon removal of the current or in other words, when the circuit is open, it will cease to be a magnet.

Electricity in Circulation. The experiment clearly teaches that electricity in action or circulation is magnetism, for without having any steel, iron, or loadstone, this coil of wire can be made into a magnet that will attract iron or steel.

Polarity. By a little experimenting, it can be proved that the coil has two poles, one at each end, and that one is a north pole which will attract the south pole of a compass, while the south pole will attract the north pole of a compass. The coil is of copper wire, but it is not the copper that does the attracting — it is the electric current in the coil, for the attraction stops when the current stops.

Amount of Circulation of Current. By using one dry cell, a very weak magnetism will be induced in the coil. The stronger the current the more powerful will be the magnetism of the coil. If a coil consists of 40 turns per layer and there are six layers, the total number of turns would be 240. Therefore, the current whether weak or strong, will have to go 240



times around the core before it leaves the coil.

Ampere Turns. If a battery delivers 10 amperes, then 10 amperes going 240 times around will produce exactly the same magnetic effect as 1 ampere going 2,400 times around, or a circulating of 2,400 "ampere turns." One ampere turn means 1 ampere going around once.

Rule. To ascertain the number of ampere turns in any magnetizing coil, count the number of turns, observe the number of amperes, and then multiply the two numbers.

Solenoid with Spring Armature

This instrument provides plenty of instruction. Incidentally, its construction will also prove a valuable exercise in apparatus making. It is shown in Figure 2.

The Bobbin. This may be made by using a fiber tube with an internal diameter of 3/8 in. Prepare two wooden disks or flanges about 1¾ in. in diameter, having a central hole just large enough for the fiber tube to fit tightly. Three-ply plywood, ¼ in., thick will be found to be suitable material for making the disks. Glue these disks on, one at either end of the tube, making an over-all length of 3 in.

The Coil. To wind the coil, make a small hole in one flange close to the tube, thread an end of the No. 20 D.C.C. wire through this hole and wind about eight layers. Mount the completed bobbin on a baseboard and make a suitable frame as shown in Figure 2.

Iron Core. This consists of a piece of cold-rolled steel of 3/8-in. diameter, about 5 in. long. Drill a small hole at one end, and support it from the cross member of the framework by means of a spiral spring, so that its lower end will enter the bobbin (sliding fit).

The Spring. This is easily made by coiling a steel wire such as is used on a mandolin (E string will do). To hold the spring in place, drill a small hole in a No. 5 brass wood screw, near the head of the screw, and insert it in the cross member of the frame, making sure that when the spring is placed it will be directly over the steel core.

To Operate the Solenoid. Connect one dry cell to the terminals. Immediately on making this connection, the core is drawn into the bobbin. By connecting two or more dry cells, the movement is made greater, owing to a greater amount of current being supplied.

A scale placed on top of the bobbin as shown in Figure 2, will show the various strengths of current required to produce certain movements of the core. As a matter of fact, meters are made on this principle.

Sensitive Galvanometer. The instrument as shown in Figure 3 presents no great difficulties in construction, and will be found to be really very sensitive and of much general utility. It is free from the prolonged swinging of the needle generally found in other types, and it is not affected by the earth's magnetism.

Figure 4 shows the front elevation of the coil with the windings omitted.

Figure 5 shows an isometric sketch of the woodwork. In constructing the wooden frame or bobbin, the student must follow the dimensions carefully, any odd pieces of well-seasoned wood will do. The supports separating the top and bottom of the bobbin are glued into place.

Any finish may be adopted by the student. If no other is given, it is advisable to give the woodwork a good rubbing with linseed oil to preserve it from dampness. When the glue is set, cut a strip of thin, strong paper, 2 in. wide and about 10 in. long. Dampen it slightly and then wind it around the two supports and between the flanges of the bobbin, snipping the corners and securing the starting and finishing ends with a touch of glue. When the paper is dry, it will have stretched quite tight and will form a good foundation on which to wind the wire.

The Coils. The first is a high-resistance winding of two even close layers of No. 30 D.C.C. wire, or a gauge somewhere near that. The beginning and finishing ends of the wire are led through two small holes at one end of the lower flange. This winding is given a coat of shellac, and a strip of paper is laid over it and also varnished. The outer winding consists of two close layers of No. 20 D.C.C. wire, also varnished, and forms the low resistance. The ends are led through holes at the other end of the lower flange. Fasten all ends to terminals, or to No. 6 brass machine screws.

The Magnet. The magnet in Figure 6 is made from a ⅛ by ½ by 1⅞-in. strip of steel. Drill a 7/32-in. hole through the magnet. Then place the steel in a clear fire until it is red hot all over, lift it out quickly and drop it into cold water. This treatment will make it black, hence it must be polished with fine emery cloth. Then magnetize the steel by rubbing it many times with one pole of a strong horseshoe magnet, always in the same direction.

Brass Boss. This is made from a brass rod 3/8 in. in diameter. Place the rod in the universal chuck of a lathe, and turn it to the dimensions shown in Figure 7. To assemble the boss and magnet, press the boss into the 7/32-in. hole until its flange fits snugly to the side of the armature. Then rivet over the other end of the boss as directed in Figure 6.

The Spindle. The spindle shown in Figure 6 is made from a knitting needle. The ends must be worked up to nice points, which must be quite central and finished very smooth. When finished, the spindle's over-all length should just exceed ½ in. Drive the spindle into the hole of the brass boss until it projects equally on either side of the magnet.

Pointer and Counterpoise. These are made from a piece of No. 18 wire, the insulation being removed. See Figure 4. Fasten to the boss with just a trace of solder. Do not make the soldering too long a job or the heat of the iron may impair the magnet. The counterpoise is formed of a small loop of the wire filled with solder. Hold the ends of the spindle between the finger and thumb, and with a little manipulation of the counterpoise, balance the pointer.

Bearings. The bearings shown in Figure 8 are made of sheet brass, preferably hard, ½ in. wide, the length equal to the height of the bobbin. Countersink the center of the brass for the ends of the spindle. Screw the bearings in place with No. 3 by 3/8-in. f.h. brass screws. Carefully lower the magnet into its place so that the ends of the pivot rest in the recessed part. Adjust the spring of the bearings so that the magnet can swing freely, but with no chance of slipping out of place.

The Scale. The scale, shown in Figure 9, is drawn on a piece of white cardboard. The graduations along the top line (the tangents) are spaced 1/5 in. The scale can be cut out by using a sharp knife. Secure the ends of the scale by gluing them to two small blocks made from dowel pins, which are glued in place on the top flange.

The whole can be placed in a suitable wooden frame, front and back enclosed with glass. This prevents the dust from collecting on the coil and moving parts, and makes a better looking job.

Induction from Coil to Coil. The apparatus shown in Figure 10 should be made and its performance carefully studied, as it will serve to demonstrate the principles of induction and the action of several forms of instruments.

Connect a battery to the terminals of coil A, and a sensitive galvanometer to the terminals of coil B. By making a circuit between coil A and the battery, there will be an immediate and transient effect on the galvanometer in the B circuit; the needle will deflect, oscillate, and finally return to zero. On breaking the connection with the battery, the galvanometer again will show a temporary disturbance, but the deflection will be in the opposite direction.

Note that the two coils are quite separate, electrically, from one another. When the current circulated in the A coil, the magnetism from the current magnetized the iron core, the magnetism from the iron core acted on the coil B, and had inductively generated currents in it. At this point, it may be mentioned that this arrangement of the two coils is a model of the much-used transformer of such great utility in alternate-current work.

Suggested Experiments

1. Place the two bobbins one on the other (without the iron core) and pass the current. Note deflection of galvanometer needle on making and breaking contact.

2. Insert the iron core in the bobbins, and notice the increased magnetic strength of the induced currents.

3. Vary the positions of the bobbins on the core, noting any variations in strength of currents.

4. Connect the galvanometer to the bobbin or coil A, and the battery to coil B, note deflection of needle.

5. Using coil A in circuit with the galvanometer, place the pole of a permanent magnet within it. Note deflection of needle on entry, and removal and also reversal. See Figure 1.

Construction of Bobbins. The flanges are made of whitewood ¼ in. thick, the tube joining the flanges is made of a fiber tube with an internal diameter as indicated in Figure 11. A coat of varnish over the whole will pro-

vide a good finish. The two bobbins should be made alike.

Coil A is made by winding ¼ lb. of No. 32 S.C.C. wire, and coil B with the same amount of No. 20 S.C.C. These gauges of wire should be followed as closely as possible, the only deviation being that finer than the No. 32 or thicker than the No. 20 might be used. The exact quantity is not of great importance, and if the bobbins are filled, it will be just as well. Mount the terminals on the outside flange in each case.

Iron Core. The core is made of iron, or of mild steel. Its diameter should be large enough to slip comfortably into the tube, and it should be about 6 in. long.

The Galvanometer. The galvanometer should be as sensitive as possible, the moving-coil type being excellent for the purpose, though the horizontal form, shown in Figure 3, will do if the high-resistance winding is used.

Current Supply. This may be obtained by using a storage battery, or two or three dry cells.

Thermal Effects. The passage of a current along any conductor is always accompanied by heat, this being the outcome of resistance. Generally, the heating is slight and passes unnoticed. Heat being a waste of energy, care should be exercised in the choice of conductors so that the resistance may be as low as possible.

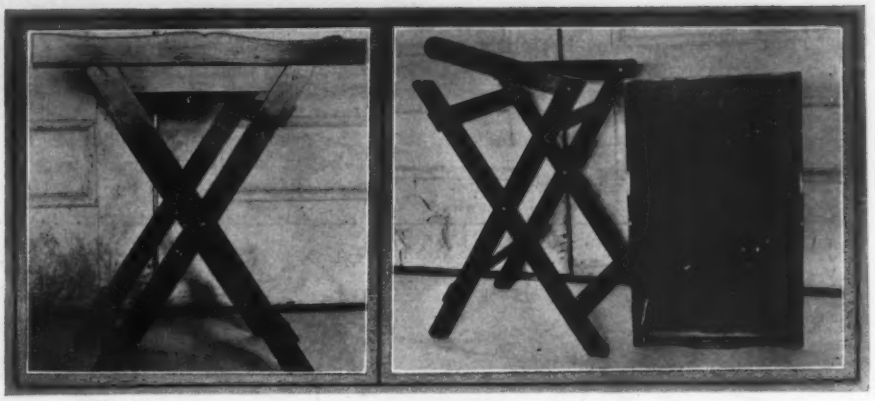
When an electric current is stopped by resistance, the energy of its flow is transformed into heat by the resistance of the circuit. If a thick wire of low resistance is placed across the terminals of a dry cell or battery, the greater portion of the heat will be in the battery. By placing a thin wire of high resistance across the terminals, it will get hot, and the battery will remain comparatively cool.

The heat generated in a conductor by an electric current is proportional to the resistance of the conductor, the time during which the current flows, and the square of the strength of the current. It is measured in calories. The calorie is a unit of heat and represents the quantity of heat necessary to raise 1 gram of water 1 deg. C. Calories per second = volts × amperes × .24. *Example:* If a current of 5 amperes flows in a wire at a potential of 24 volts, how much heat will be developed in 5 minutes? $5 \times 24 \times (60 \times 5) .24 = 8{,}640$ calories.

Materials Required for This Experiment. One thermometer such as is used in scientific work (Fig. 12), or one of those with a paper scale inside the tube such as is used for testing the heat of bath water. Six yards of fine resistance wire, one or two dry cells.

Procedure

1. Mount the thermometer on support similar to that shown in Figure 12.
2. Wind the resistance wire around the bulb of the thermometer connecting the ends to the terminals.
3. Connect the battery to terminals. Allow the current to pass for a definite time, and observe rise in temperature.

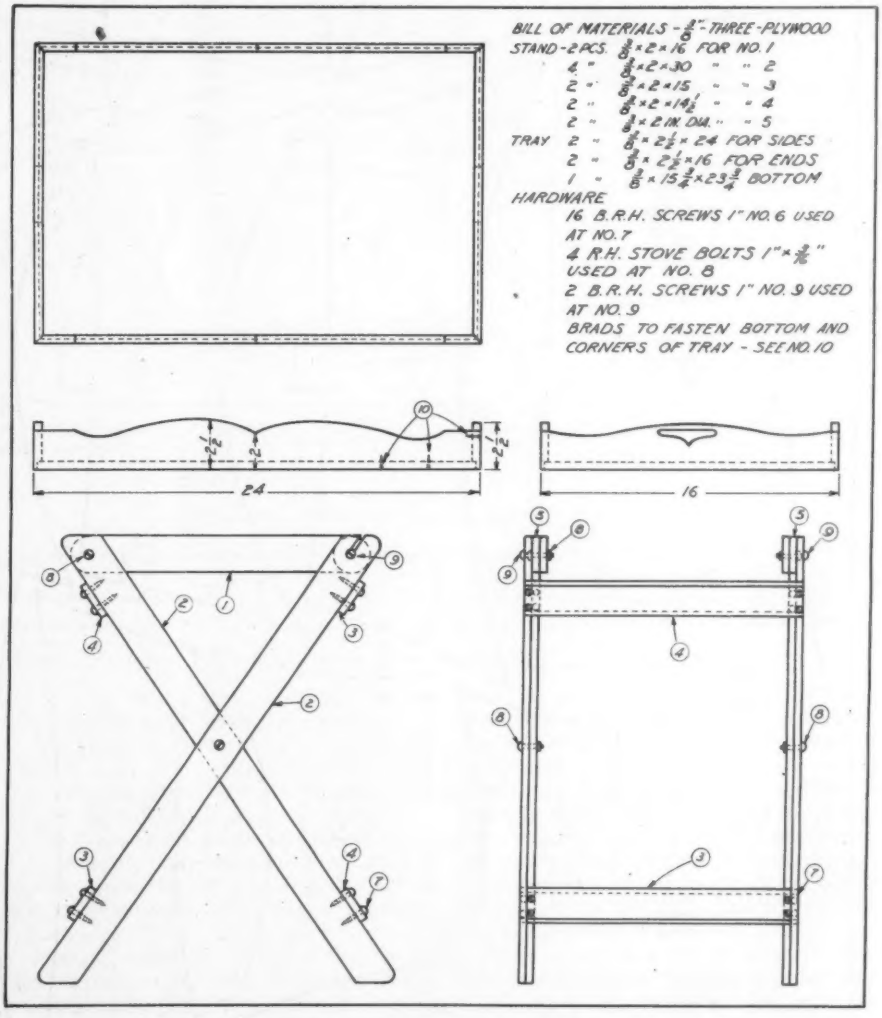


Tea tray and folding stand

TEA TRAY AND FOLDING STAND

O. Kay Moe, Director Industrial Arts, State Normal College, Dillon, Montana

The tray and stand described in this article can be made by almost any junior-high-school pupil at a small cost. The material may be of any kind of plywood, depending on the amount of money one wishes to spend. The project may be finished in paints, or in stain, shellac, and varnish, or in any other desired way. The stand and tray may be used instead of a tea wagon. It can be conveniently folded and put away in a small space. The folding stand also may be used for a luggage stand.


BILL OF MATERIALS - ⅜" THREE-PLYWOOD
STAND - 2 PCS. ⅜ × 2 × 16 FOR NO. 1
4 " ⅜ × 2 × 30 " " 2
2 " ⅜ × 2 × 15 " " 3
2 " ⅜ × 2 × 14½ " " 4
2 " ⅜ × 2 IN. DIA. " " 5
TRAY 2 " ⅜ × 2½ × 24 FOR SIDES
2 " ⅜ × 2½ × 16 FOR ENDS
1 " ⅜ × 15¾ × 23¾ BOTTOM
HARDWARE
16 B.R.H. SCREWS 1" NO. 6 USED AT NO. 7
4 R.H. STOVE BOLTS 1" × ⅜" USED AT NO. 8
2 B.R.H. SCREWS 1" NO. 9 USED AT NO. 9
BRADS TO FASTEN BOTTOM AND CORNERS OF TRAY - SEE NO. 10
24
16

Details of tea tray and folding stand

MODEL CLIPPER SHIP IN METAL

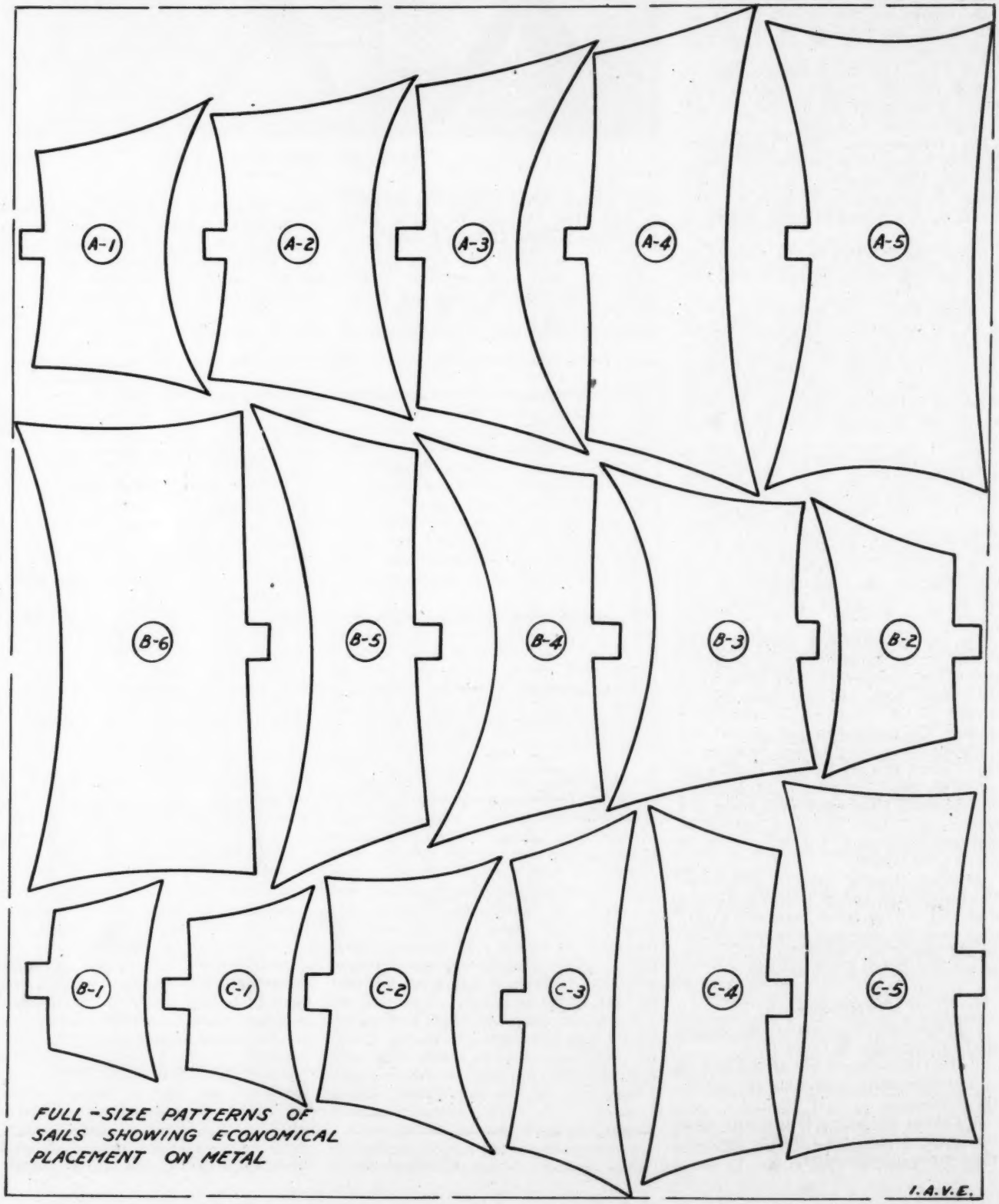
Cecil Ford and Sam Phillips, High School, Delmar, Delaware

A model of a clipper ship in brass and copper not only makes a beautiful ornament for the home or office but offers an excellent opportunity for self-expression.

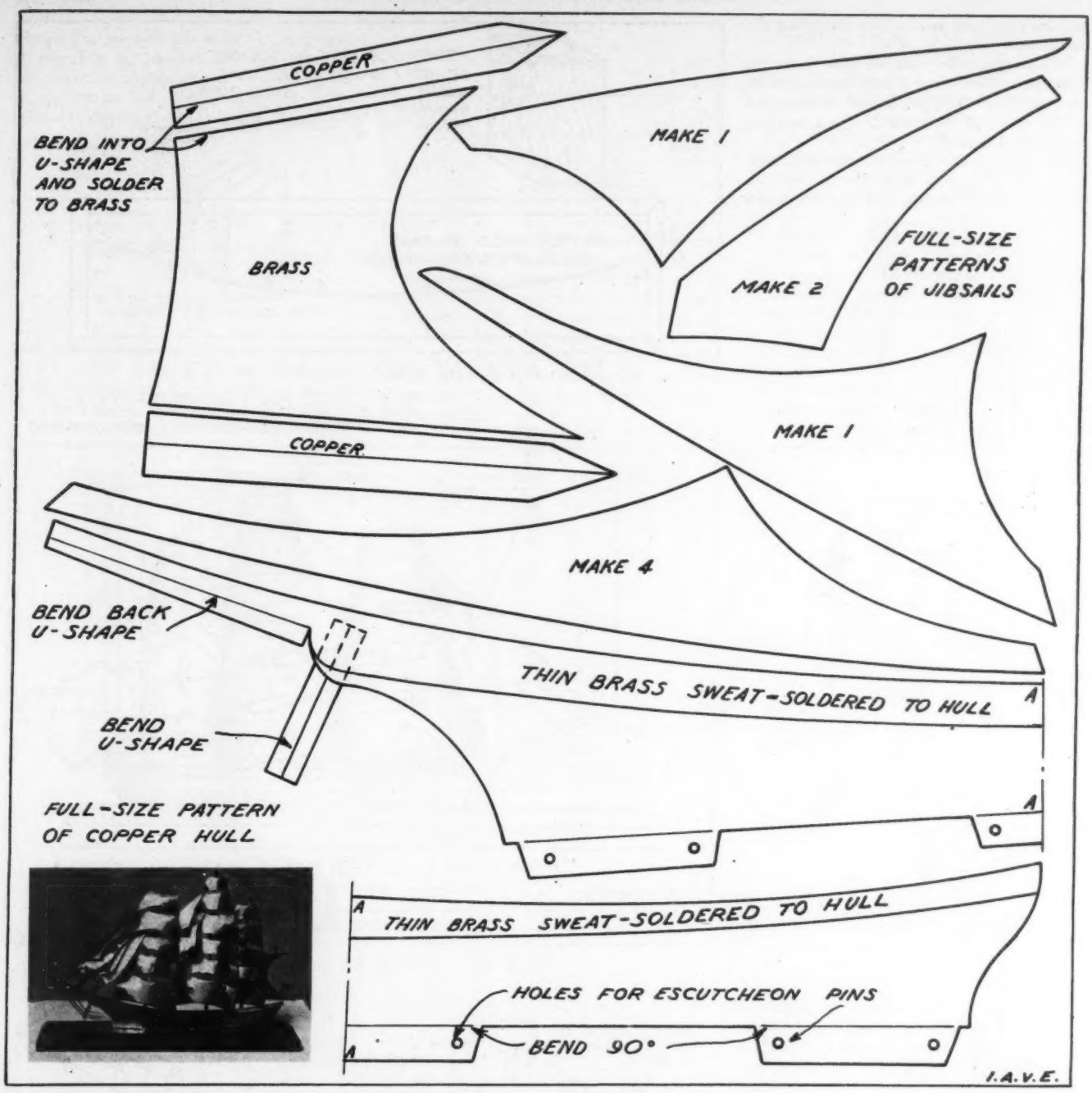
The sails are cut from thin brass and hammered over a forming block with the round end of a ball-peen hammer to give the effect of sails filled with wind. A narrow strip of thin brass sweat-soldered to the top of the copper hull makes the hull more decorative and artistic. The connections are all soldered. The base is walnut with a rectangular piece of 1/16-in. brass fastened to the top with ¾-in. escutcheon pins.

After the pieces are all made and assembled, the brass and copper parts are rubbed with No. 000 steel wool then polished with any good metal polish. A thin coat of metal lacquer or wax will prevent tarnishing.

The walnut base may be waxed or shellacked.



FULL-SIZE PATTERNS OF SAILS SHOWING ECONOMICAL PLACEMENT ON METAL



Details of hull and jibsails. For assembling sketch see page 216

THE MORTISE-AND-TENON JOINT — IX

John E. Doren, Eureka High School, Eureka, California

(Continued from page 139, April, 1937)

Case I. Width of Groove Approximately One Third the Thickness of Stock

A. Stock Grooved on One Edge Only

A good example of this variety of the tenon joint is found in the construction of panel doors when the rails and stiles are joined with tenons. See Figures 67 and 68.

When the stock is grooved to receive flat panels, the thickness of the panel determines the width of the groove. If raised panels are to be used, the thickness of the panel at the edge determines the width of the groove.

The thickness of the tenon is governed by the thickness of the panel edge when this thickness is approximately one third the thickness of the rails and stiles.

The depth of the groove, by common practice, is usually made about equal to the width of the groove for all grooves under ½ in. wide. Even wide grooves are seldom made over ½ in. deep.

Figure 68 shows the relation of the mortise and the tenon to the different members of the assembled work.

It is common practice to tenon rails before the grooves are cut, but the relation of the tenon to the groove is often more easily understood if the grooves are cut first. When one is thoroughly familiar with the different varieties of tenons and their application to different conditions of work, the procedure to follow in cutting a tenon is a matter of personal judgment. The different factors that influence the procedure are: (1) the particular problem or job at hand; (2) the character and capacity of the equipment; and (3) the skill of the worker.

If tenons are to be cut by hand, all lines should be laid out on all ends to be tenoned before any cutting is started. If tenons are to be cut by machine, the tenon should be accurately laid out on one end of one piece

and this piece used as a pattern for setting the machines.

It is recommended that all lines across the grain be marked with a hard pencil, sharpened to a knife-like point, and all lines parallel to the wide face be marked with a marking gauge. See Figure 69.

Notice in Figures 69 and 70 that the cheeks of the tenon in each figure are in line with the walls of the groove, and that the width

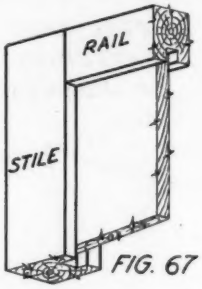


FIG. 67

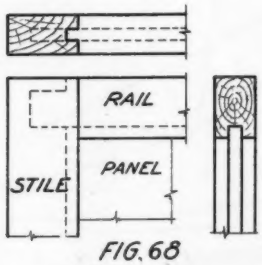


FIG. 68

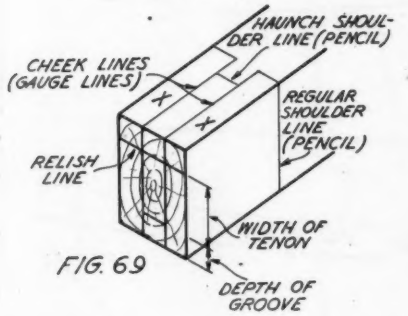


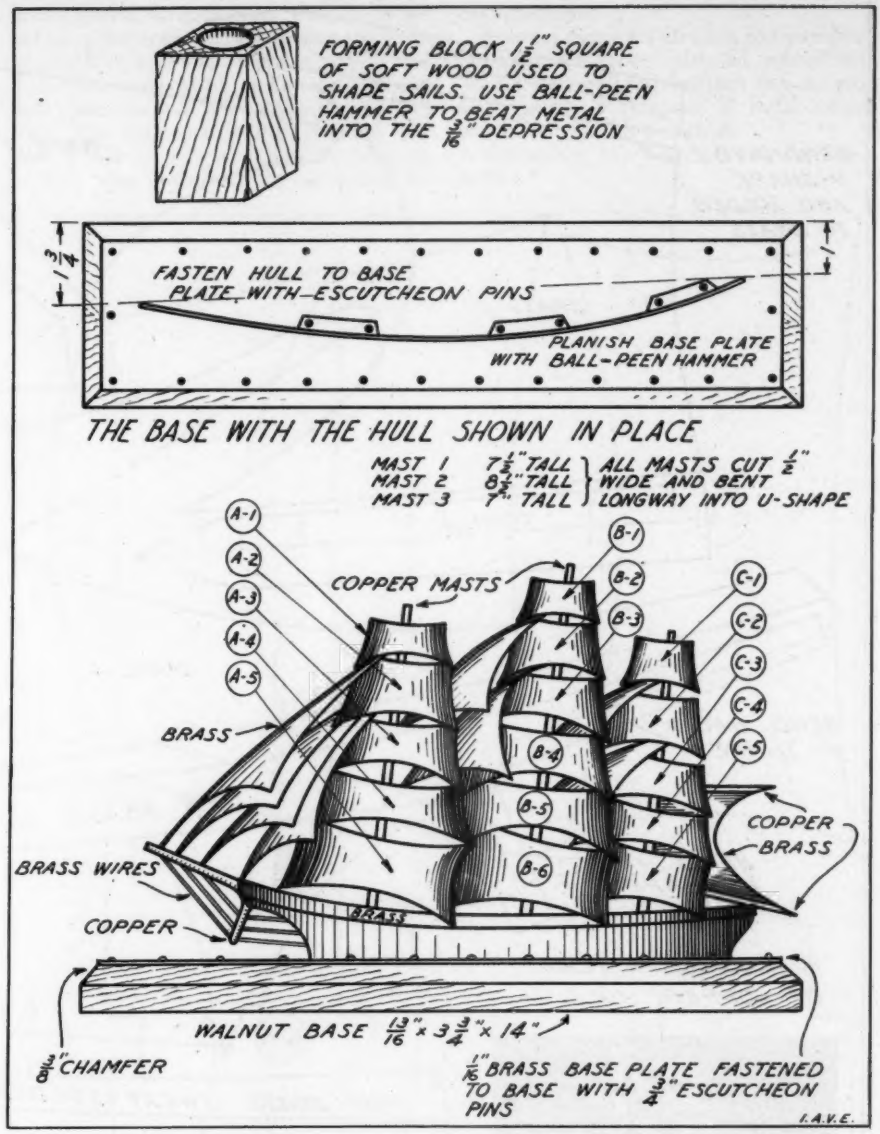
FIG. 69

of the tenon is measured from the bottom of the groove to the tenon relish line. In Figure 70 the relation of the mortised member to the tenoned member of the joint is indicated. The length of the tenon haunch should be just long enough to fill the groove in the mortised member.

Notice that the tenon on material grooved on one edge is reduced in width by the depth of the groove as well as the relish, but the reduction due to the groove must not be confused with the reduction due to relish. When a tenon of this variety is properly described or specified on a cutting bill, there need be no misunderstanding.

An example of a cutting bill of the rail shown in Figure 71: 1 rail 1½ by 4 by 28 in., grooved 1 edge ½ by ½ in., tenon 2 ends ½ by 2¾ by 3 in., relished and haunched.

The amount of relish need not be specified. The depth of the groove is known and also the width of the tenon is known; the rest of the tenon is relished away.



For details of sails and hull see pages 214 and 215

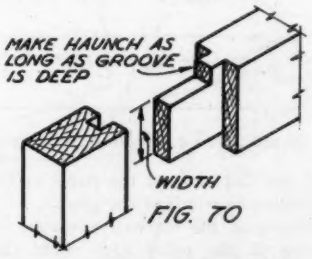


FIG. 70

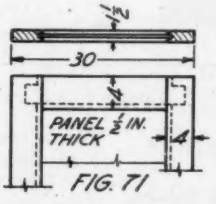


FIG. 71

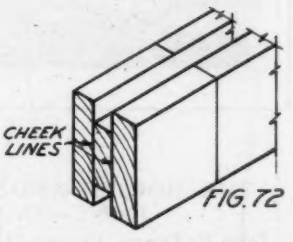


FIG. 72

B. Stock Grooved on Two Edges

Figure 72 shows the layout of a tenon. Notice that the cheek lines are in line with the walls of the grooves. Imagine the stock built up of three pieces — two wide ones on the outside and a narrow one between them. To provide a tenon in this case, the outside pieces are cut away, leaving the center piece to form the tenon as shown in Figure 73.

An example of a cutting bill of a common rail, grooved on two edges, is shown in Figure 74. One piece 1½ by 4 by 26 in. grooved two edges ½ by ½ in., tenon 2 ends ½ by 3 by 3 in.

The tenons shown in Figure 74 have the appearance of being relished on two edges, but this reduction in the width is due to the grooves and must not be confused with relish.

In all of the foregoing, it has been assumed that the tenon has been placed in the center of the thickness of the stock, but this is not necessarily true in all cases. If the grooves for the panels are off center, this will influence the position of the tenons, for the tenon cheeks

should line up with the walls of the grooves if this is at all possible. If the grooves are off center, an additional note should be added to the cutting bill. For example, take a rail similar to the one shown in Figure 74, but with

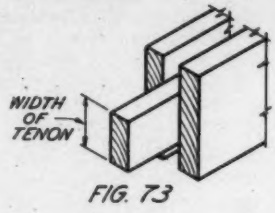


FIG. 73

the panel grooves off center: 1 piece 1½ by 4 by 26 in., grooved, 2 edges ½ by ½ in. Grooves offset, see detail, tenon 2 ends ½ by 3 by 3 in.

In many shops it is common practice to

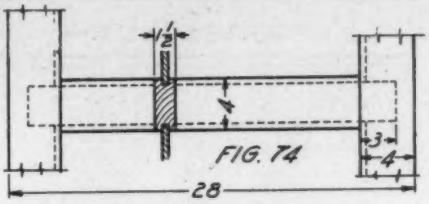


FIG. 74

draw a section of the rail, showing the exact position of the groove on the cutting bill.

Notice in the cutting bill that the length of the rails includes the tenons. The listed length of the rails is the maximum length over all; there is nothing to be added to the figure as listed; it is the finished length. By using this system of listing materials, there is no danger of cutting stock too short through a misunderstanding.

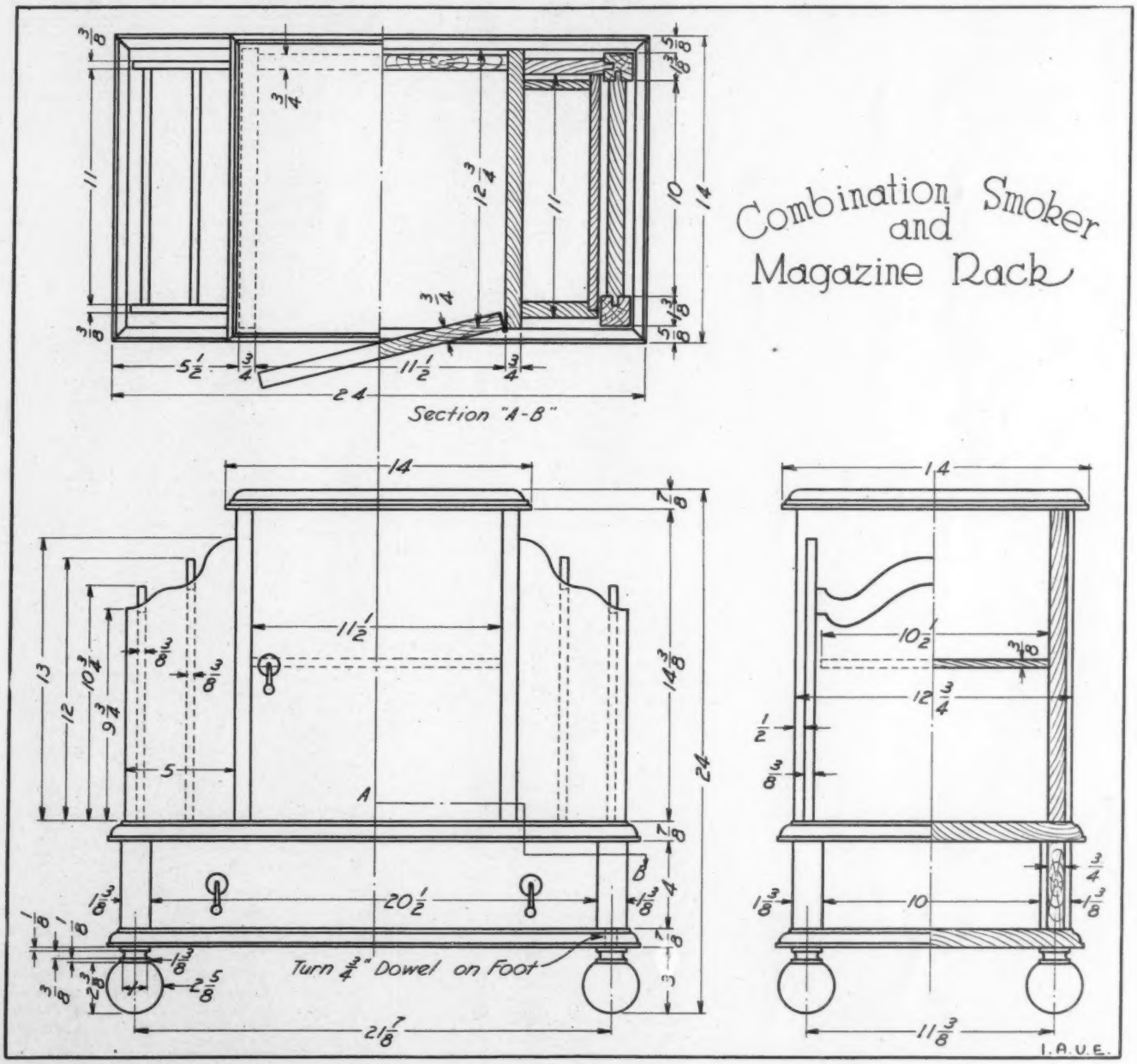
(To be continued)

COMBINATION SMOKER AND MAGAZINE RACK

Allan V. Winegard, Glenside Weldon Junior High School, Roslyn, Pennsylvania

The combination smoker and magazine rack illustrated and described herewith may be used in either the junior or the senior high school. Walnut or mahogany are the best materials for this project. Thin material should be of plywood.

The sides and back are joined to the legs with mortise-and-tenon joints. The top and bottom of the base and the top of the smoker compartment may be dadoed for a molding, or they may be molded in the shop. Matched veneering on the door is very effective. Old silver pulls and butts harmonize very well with the design and a bullet catch should be used on the door. The feet are fastened to the bottom with a dowel turned on the foot.



Answers to Questions

REFINISHING GOLF CLUBS

1028. Q.: I am about to refinish some wood golf clubs. Will you kindly tell me how to proceed? — *J. M. D.*

A.: In view of the fact that I service factories making golf clubs, I am in a position to give you first-hand information which should prove satisfactory in your case.

1. Sand the persimmon wood, of which the clubs are usually made, to the raw wood.

2. Apply a water stain of either walnut, mahogany, or black as your taste may dictate. Dry 12 hours.

3. Warm the clubs on a radiator to about 100 deg., about what feels too hot to be comfortable to the bare hand. Do this quickly rather than slowly over an hour's time, for instance.

4. While hot, dip into a sealer made up of three parts of gasoline and one part of 4-hour varnish. Leave until the violent bubbling, caused by the varnish driving the hot air out of all open pores, ceases. Let cool and then wipe clean with a hard-finished cloth like cotton broadcloth from a discarded shirt. Let dry over night in a warm room at 80 deg. F.

5. Make up a match filler on a silex base and carrying about 10 lb. of paste per gallon of thinner. The thinner should be one part turps and two parts standard gasoline. Apply the filler generously, let the gloss flat off, and then pad in carefully. Wipe with a clean cloth and let dry about two days in a warm room.

6. Spray or brush on a coat of 4-hour varnish which has been reduced 10 per cent with pure turps. Lay on a full but not heavy coat, free of sags. Let dry 24 hours.

7. Dry overnight in a warm room, sand clean and level with a split No. 6/0 paper.

8. Dust off and spray a coat of 4-hour varnish which has been reduced 10 per cent with pure turps. Lay on a full but not heavy coat free of sags. Let dry 24 hours.

9. Dry, sand, dust off, and apply a final coat which should be allowed to dry three days in a warm room.

10. Leave in the full gloss if desired but the dirt and mud will clean off more freely and the finish will appear more satisfactory over a longer period of time if the final coat is oil-rubbed with FFF pumice stone, felt pad, and crude oil. When the rubbing is completed, leave on the sludge and with a pad of clean white cotton waste dipped in water rub the heads for the final finish. Wipe clean with dry cloths and polish. Let dry at least a week before using. An occasional rub with the cotton waste pad last used will keep the clubs looking fine over a season's hard driving in the rough and traps unless you are one of those chaps who hit par consistently.

A final caution. Do not use shellac or lacquer at any time in this specification, for to do so will guarantee chipping or flaking which has yet to occur with the directions as given. — *Ralph G. Waring.*

Personal News

APPOINTED CONSULTANT IN VOCATIONAL EDUCATION

Mr. Frank Cushman has been appointed Consultant in Vocational Education for the United States Office of Education. Mr. Cushman, who was formerly chief of the trade and industrial-education service, will work under Dr. J. C. Wright, Assistant Commissioner of Vocational Education. In his new position, Mr. Cushman will carry on investigations and direct research in the field of vocational education. He will plan, organize, and conduct studies in research and will be available for the training of conference leaders for various purposes.

Frank Cushman

¶ Dr. Richard D. Allen, of Providence, R. I., has been appointed expert consultant in guidance, on a part-time basis, for the United States Office of Education. Dr. Allen is a graduate of Brown University and is considered one of the leading authorities in educational and vocational guidance, having served as lecturer in the graduate schools of Harvard, Brown, and Boston Universities.

¶ Mr. C. K. Lush, Assistant Supervisor of Industrial Arts at Minneapolis, Minn., has been appointed as a member of the summer-school staff of the Oregon State College in Corvallis, Oreg. Mr. Lush will work under Mr. George B. Cox and will have charge of the teaching of two professional courses and will direct courses in thesis writing. Mr. Lush, who received his master's degree from the University of Minnesota, completed his graduate work under the direction of Prof. Homer J. Smith.

¶ Mr. Frederick B. Eiseman, who was recently elected vice-president of the board of trustees of the David Ranken, Jr., School of Mechanical Trades, was formerly secretary-treasurer.

Mr. Eiseman, was born in St. Louis. He attended Smith Academy and later received his A.B. degree from Yale. He is vice-president of the Rice-Stix Dry Goods Company, director of the Chamber of Commerce, and Vice-president of the Industrial Loan Company.

¶ Tom Hippaka, supervisor of the manual-arts department at Madison, Wis., has been given the degree of doctor of philosophy. Dr. Hippaka has been very active in the upgrading of industrial-arts work in his own city, as well as in the State of Wisconsin.

¶ Mr. Roger D. McDermott has been appointed principal of the Connecticut Junior Republic Trade School at Litchfield, Conn. Previous to his appointment at Litchfield, he had been serving as instructor in related subjects at the Boardman Trade School, in New Haven, and had been instructor in adult education for four years. Mr. McDermott is a graduate of the College of William and Mary, in Virginia, and since his graduation, has been serving in the vocational field in Connecticut.

¶ Mr. Frank Riese, who has been on leave of absence from the Detroit public schools while engaged in an administrative capacity for the Fisher Body Craftsmen's Guild, has recently returned to his teaching duties. Mr. Riese is now engaged as instructor in woodworking at the Western High School.

Association News

¶ The twenty-first annual convention of the New Jersey Vocational and Arts Association was held in Asbury Park, on March 17, 18, and 19.

The supervisors' and administrators' program was centered about the theme, "The Organization and Administration of New Programs in the Fields of Trade and Industries." John A. McCarthy, of the New Jersey State Department, was chairman.

The theme of the general meeting was "Trends in Guidance." Dr. Paul Loser, Trenton, reported on observations of guidance programs, while on a study tour with the National Occupations Conference, Dr. Rex B. Cunliffe, Rutgers University, spoke on "Development of Guidance in New Jersey."

The industrial-arts groups discussed the themes, "For What Are We Training Our Pupils?" and "Industrial Arts and Its place in Secondary Education."

The subject of the girls' vocational section was, "How to Staff the Expanding Program." Four leaders in the field presented various viewpoints which were summarized by Dr. Millard Lowery, of Middlesex County.

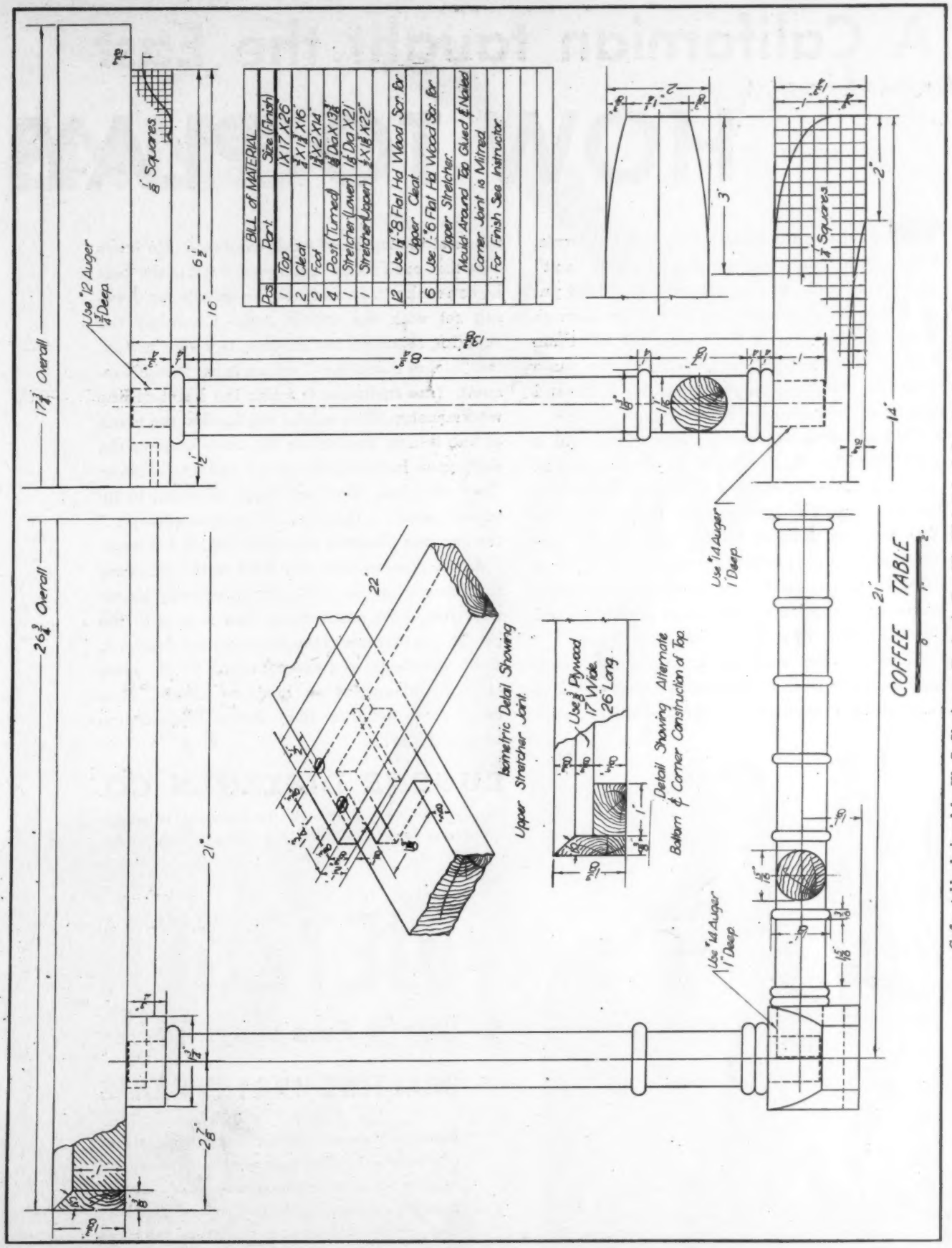
The boys' section was concerned with the growing problem of "Legal Liabilities of Teachers and Public-School Administrators in Cases of Accidents to Children." The speakers were Dr. C. J. Strahan, Dr. Daniel R. Hodgson, and others.

The New Jersey Guidance and Personnel Association took for its theme, the topic, "Placing the Worker." A group of New Jersey's most outstanding personnel directors discussed the topic.

The new officers elected for the year were: President, Martha Berry; first vice-president, Harrold D. Channon; second vice-president, Ronald Kent; third vice-president, Eunice Harrison; treasurer, Frank R. Flower; secretary, John J. Berrila. — *Albert E. Jochem.*

¶ The third annual spring conference on industrial-arts teacher education was held at the Oswego State Normal, on Apil 5 and 6, 1938. Dr. H. Claude Hardy, superintendent of schools, White Plains, N. Y., gave an address on "Seven Wise Men." Dr. Hardy, also, conducted a discussion on "Educational Values and Industrial Arts." Mr. Oakley Furney, State Education Department, spoke on "The Development of Leadership in Industrial Arts." Other speakers included Eugene D. Fink and Roy G. Fales of the State Education Department; C. R. Dixon, supervisor of industrial arts, Ithaca, N. Y.; Anthony Marinaccio, Hartford, Conn.; Raymond

(Continued on page 14A)


BILL of MATERIAL
Pcs | Part | Size (Finish)
1 | Top | 1X17 X26
2 | Cleat | ¾X1¾ X16
2 | Foot | 1¾X2 X14
4 | Post (Turned) | 1¾ Dia X13¾
1 | Stretcher (Lower) | 1½ Dia X21
1 | Stretcher (Upper) | ¾X1¾ X22
12 | Use ¼"-8 Flat Hd Wood Scr for Upper Cleat
6 | Use 1"-6 Flat Hd Wood Scr for Upper Stretcher.
Mould Around Top Glued & Nailed
Corner Joint is Mitred
For Finish See Instructor
17¾" Overall
Use ½" Auger ½" Deep
1" Squares
6½"
16"
8¾"
13¾"
3"
2"
14"
26¾" Overall
21"
28"
22"
Isometric Detail Showing Upper Stretcher Joint.
Use ¾" Plywood 17" Wide 26" Long
Detail Showing Alternate Bottom & Corner Construction of Top
Use ¼" Auger 1" Deep
COFFEE TABLE

Coffee table designed by W. S. Sherinyan, Benjamin Franklin High School, Los Angeles, California

A Californian taught the East

HOW TO PLAY

It is said that until McLaughlin left California, the eastern tennis players played a very "soft" game—"pat-ball" as one observer scornfully put it. McLaughlin cannonaded his service through their ranks, defeated them all—but left them with a new idea. They developed the same smashing service, then went across the water and wiped up their British cousins. . . .

This is a striking example how every man is held down by what he is accustomed to; and an example of the power of a new idea. Let a man be accustomed to inferior things, let him think that there is nothing better, and he will stay through life in his own little rut. But give him a taste of the *better* things beyond, the satisfactions and happiness to be found at the top, and he will make every effort to lift himself up.

There is a lesson here for every intelligent, ambitious student of mechanical drawing. The wise student takes care to surround himself with the best examples of work available. He takes care that each piece of his own work is the best he can make it. In addition, he selects his drawing set with the utmost care. Choosing the superior, rejecting the inferior, is a step toward the "divine discontent" which leads to achievement. Fine instruments foster the habit of fine workmanship. They school his hand to the touch of fine things, strengthen his knowledge of the difference between the good and the shoddy. They give him the confidence essential to inspired work . . . the pride of craftsmanship . . . the genuine pleasure the artist finds in his work.

A fine possession of any kind works this very real "magic" on its possessor; everybody knows this. And how much more true it is with the possession that serves the student through school, through college, and even through all the years of his professional or business career. How much more essential then that *this* possession be really fine!

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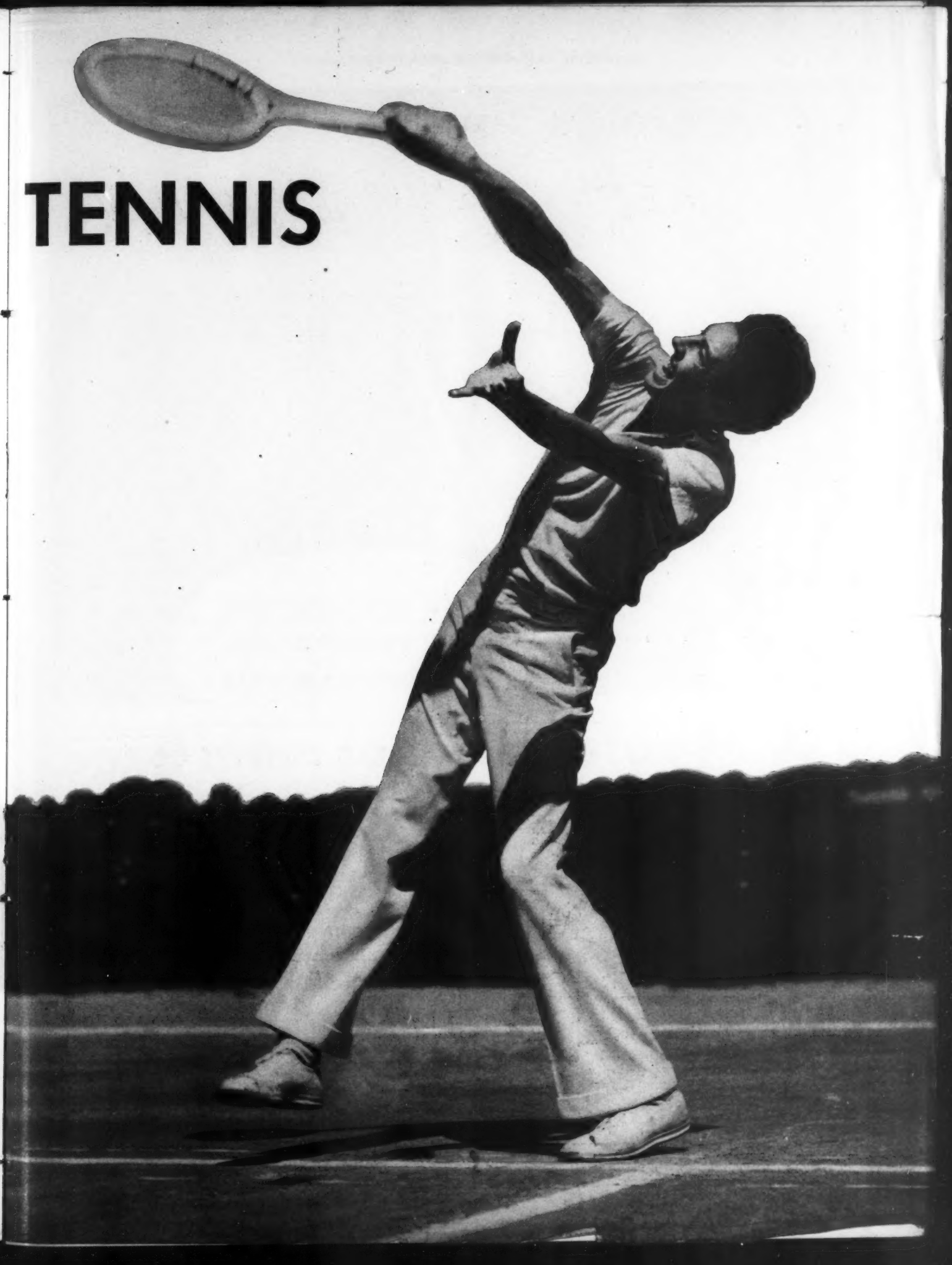
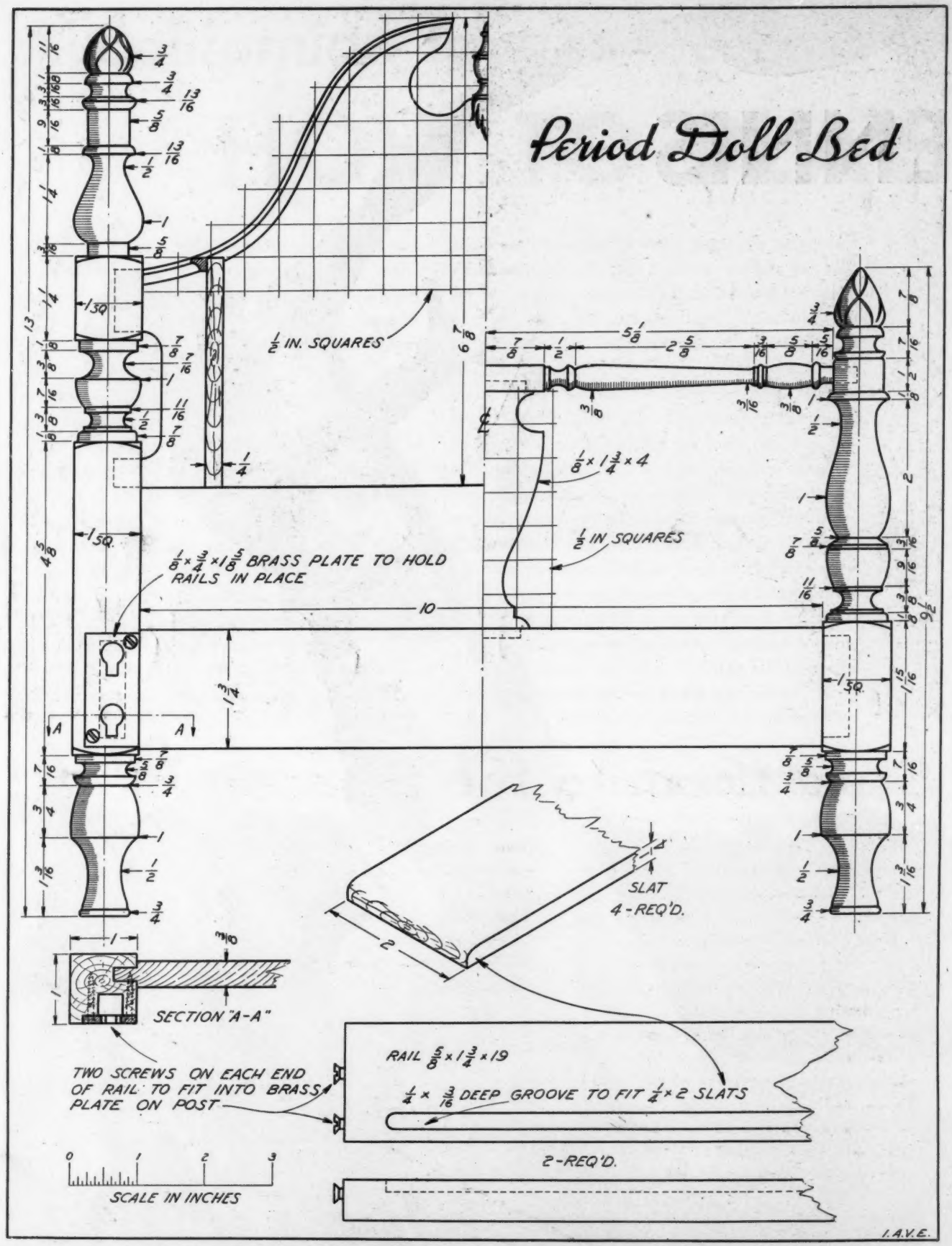
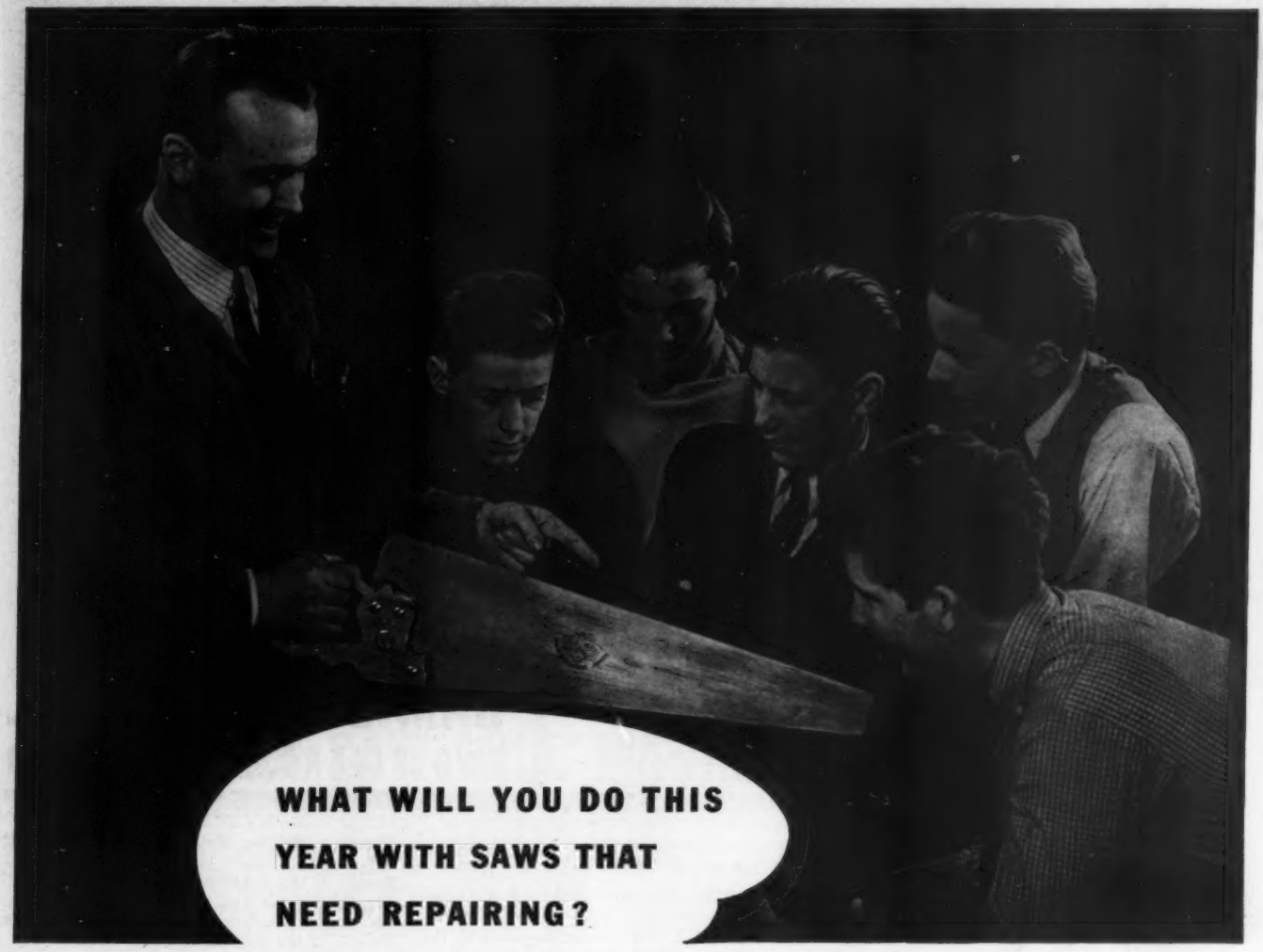
TENNIS




Period Doll Bed
1/2 IN. SQUARES
1/8 × 1 3/4 × 4
1/2 IN SQUARES
1/8 × 3/4 × 1 5/8 BRASS PLATE TO HOLD RAILS IN PLACE
10
SLAT
4 - REQ'D.
SECTION "A-A"
TWO SCREWS ON EACH END OF RAIL TO FIT INTO BRASS PLATE ON POST
RAIL 5/8 × 1 3/4 × 19
1/4 × 3/16 DEEP GROOVE TO FIT 1/4 × 2 SLATS
2 - REQ'D.
SCALE IN INCHES
I.A.V.E.

Submitted by Geo. B. Frazee, Jr., Principal, Davis Vocational High School, Grand Rapids, Michigan



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(Continued from page 218)

W. Phipps, State Teachers College, New Britain, Conn.; and Dr. Ralph W. Swetman, Dr. Leo T. Cribben, Dr. Lucien B. Kinney, and Dr. Joseph C. Park, of the Oswego State Normal School. At the annual industrial-arts banquet which was sponsored by Sheldon Forum, honor men's society, Mr. Mario Capotosto was chairman and Dr. Hardy was the guest speaker. Dr. Donald Tower was the toastmaster at a luncheon held the first day of the conference and Dr. Charles Yager, toastmaster at a luncheon held the second day. The conference closed with a social hour and tea held in the industrial-arts library. Mr. Arthur Hauler was general chairman of the conference.

¶ The Annual Conference of the Institute of Handicraft Teachers was held April 15–20, in Southport, England.

The civic authorities co-operated with the organizers of the conference in helping to make the conference a success. The mayor and the mayoresses took part in the proceedings, and Rev. Lionel Gibbs acted as chaplain of the conference.

On Monday, the induction of the incoming president, Mr. J. Hacking, took place during the opening session of the institute. In the afternoon, the Lord Councillor, Whittaker, presided and a prominent speaker addressed the public meeting.

On Tuesday the adjourned annual meeting continued, at which important questions were discussed. In the evening the annual banquet was held in the Victoria Hotel.

There was an exhibit of handicraft, comprising a large display on materials, on Saturday.

The trades exhibit proved to be larger and better than ever. Many of the best firms displayed workshop and handicraft equipment, tools, and machines for handicraft work.

Following the program there were a number of tours to interesting places in the lake district, the playground of England.

¶ The national convention of the Future Craftsmen of America will be held in Detroit, Mich., May 5, 6, and 7. Detroit was the scene of the first national convention of the association in November, 1936, when 200 boys from all sections of the country launched a national movement to promote the spirit of craftsmanship by giving recognition for definite accomplishments of skill, technical information, and leadership.

¶ The Texas Vocational Association held its annual meeting in the Baker Hotel at Dallas, on March 24. The theme of the meeting was "Future Trends in Vocational Education."

Dr. Bradford Knapp, Lubbock, was in charge of the general meeting. The speakers were Dr. J. A. Linke, Miss Ruth Huey, James R. D. Eddy, Miss Bess Stratton, Dr. James G. Gee, W. G. Crandall, and E. R. Alexander.

At the vocational section on Friday, S. C. Wilson, of Huntsville, was chairman. J. A. Linke, Washington, gave the principal address, and there were talks on agriculture by C. B. Barclay; on farm practice by J. B. Rutland, on the part-time school, by W. G. Crandall; on farm shop-work by F. D. Shackelford; and on leadership activities by A. J. Spangler, Stephenville.

The home-economics section held a meeting on Friday, with L. V. Stockard, of Dallas, as chairman. Margaret Weeks, Lubbock, discussed "Trends in the Development of Education for Home and Family Life"; Bess Heflin, Austin, talked on "Trends in the Use of Agencies and Organization in the Development of a Program for Education for Home and Family Life"; Clara Tucker gave a talk on "Importance of Family Needs"; R. E. Shephard, discussed "Trends in Building Materials for Housing"; and Will Scott Richter, talked on "Architectural Trends in the Solution of Housing Problems." Mrs. Bernice Claytor, the last speaker, took up the topic, "Adaptations and Use of Trends in Housing in the Building of Small Homes."

¶ The eleventh annual meeting of the Michigan Industrial-Education Society will be held in Detroit, on April 28, 29, and 30. The sessions will be held in the Book-Cadillac Hotel, with 550 members in attendance.

A number of prominent educators have been placed on the program, including Dr. Edwin A. Lee, Mr. L. H. Dennis, Mr. Earl Bedell, Mr. George Fern, Mr. Frank C. Moore, and Dr. William E. Warner.

A number of trips are planned to industrial, civic, and educational institutions of Detroit and the surrounding area.

Highlights of the social program of the meeting are the special luncheons, breakfasts, and teas in connection with the annual dinner and dance.

The Schoolmen's Club of Detroit join the Society in their program at the luncheon on Saturday noon.

A fine exhibit of commercial and school materials will be arranged at the Book-Cadillac Hotel.

The officers of the society are: President, Elmer C. Weaver; vice-president, Arthur L. Reagh; secretary-treasurer, Thomas P. Garrity.

¶ The Illinois Vocational Association will hold its annual convention at Chicago, Ill., April 14–16, 1938. The Morrison Hotel has been designated as the convention headquarters. Dr. Louis V. Newkirk, President of the Illinois Vocational Association and his coworkers have set up a very fine program.

(Continued on page 17A)

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(Continued from page 14A)

The convention starts with a conference of the trade and industrial supervisors and school administrators at ten o'clock Thursday morning. At this meeting, N. F. Fultz, Vocational Supervisor, Township High School, Cicero, Ill., will speak on "Methods of Placing and Keeping Track of Boys in Industry." At the evening session this conference will be addressed by Paul A. Grigsby, Principal, High School and Vocational Supervisor, Granite City, Ill. His topic will be "Trade Classes Conducted in a Cosmopolitan High School as Unit Trade Courses, and as a Separate Unit of the Regular School Courses." Roscoe Eades, Superintendent of Schools and Vocational Supervisor, Sterling, Ill., will speak on "Trade Classes in a Cosmopolitan High School as Unit Trade or General Industrial Classes, Where These Classes are a Part of the Regular School Program." W. J. Colahan, Superintendent of Schools and Vocational Supervisor, Woodstock, Ill., will lead in the discussion.

The Auto-Mechanics Contests will start at 9:00 a.m. Thursday and run through to 4:00 p.m. There will be two series, Trouble-Shooting Contest and Lubrication Contest. C. K. Anderson, of the Tilden Technical High School is the chairman of this group.

The Trade and Industrial dinner will be held at the Morrison Hotel at 6:30 p.m. Wm. H. Johnson, Superintendent of Schools, Chicago, Ill., will be toastmaster on this occasion. The speakers will be N. B. Giles, Regional Agent, Trade and Industrial Education, Washington, D. C.; Byron Dalton, Business Representative, Plasterers' Union, Local No. 5; and V. L. Nickell, Superintendent of Schools, Champaign, Ill. These men will discuss the question of trade and industrial education as seen from the Federal Office of Education, by the employer, by the representative of labor, and by a city superintendent of schools.

The Home-Economics and Commercial Education groups will have their meetings on Friday. The Trade and Industrial Education group will meet on Friday morning at 10 a.m. to discuss the Apprentice Training Program. Horace Greenly, Purdue University, LaFayette, Ind., and Joseph Sippi, President, Printing and Pressman's Union will be the speakers. In the afternoon at 2:15, George Moore, Vice-President of International Lathers' Union will address this group. The agricultural section will meet at 1:30 Friday afternoon and the speakers will be Professor J. S. Hackleman, University of Illinois and H. H. Dewey, Managing Partner, Dewey and Dewey, Kenosha, Wis. At 3:00 p.m. this group will discuss the question of "Shall we Revise our Judging Contests?" At a round-table luncheon, 12:00 Friday, at which Walter E. Durbahn, Deerfield-Shields Township High School, Highland Park, Ill., is the toastmaster, Dr. William H. Johnson, Superintendent, Chicago Public Schools, will discuss the Chicago Vocational Program.

The chairman of the general meeting held Friday at 3:40 p.m. will be Dr. Wm. H. Johnson. Wilson Frankland, Vice-President, Steamfitters' Protective Association, will speak on the "Training of Apprentices," and Dr. Homer J. Smith, Professor Industrial Education, University of Minnesota, will discuss "Some Beliefs in Vocational Guidance." C. E. Lang, Principal, Lane Technical High School, Chicago, will lead in the discussion.

The Industrial Education group will discuss Personnel and Guidance at the Saturday morning conference. W. B. Deering, Roreman High School, Chicago, will be the chairman and Dr. Clifford E. Erickson, Assistant Professor of Education, School of Education, Northwestern University, will speak on "Newer Trends in the Field of Guidance." The general meeting on Saturday will start at 10 a.m. under the chairmanship of Dr. Alexander M. Sullivan, Vocational Director, Chicago. At this meeting, Thomas J. Quigley, President, American Vocational Association will speak on "The Relationship of General and Vocational Education." Clarence Lineberger, Principal, Washburne Trade School, Chicago, will present the topic of "Objectives in Vocational Training." Professor Arthur B. Mays, Head, Department of Industrial Education, University of Illinois, Urbana, Ill., will lead in the discussion. At 12:30 Saturday, there will be a luncheon meeting sponsored by the Epsilon Pi Tau. This will be open to all. The business meeting will be held directly after the Epsilon Pi Tau luncheon.

¶ Epsilon Pi Tau, national honorary-professional fraternity in Industrial Arts and Vocational Education, held its ninth anniversary initiation and conference in connection with the meeting of the American Association of School Administrators in Atlantic City, N. J., on February 28, March 1 and 2.

The initiates who were presented by Professor C. Blair MacLean of the State Teachers College at Fitchburg, Mass., included Mr. Emerson W. Manzer, director of Industrial Arts at Bronxville, N. Y., and Dr. Ronald W. Kent, assistant director of the Essex County Vocational School at Newark, N. J.

The banquet given by the Fraternity in honor of the presidents of the sixteen chapter schools and the U. S. office of Education Conference Committee on Industrial-Arts Education was attended by fifty-five people. Dr. Gerald Gordon Pugh, director of the Poppenhusen Technical Institute, College Point, Long Island, presented the guests of the evening and Mr. Charles F. Bauder, director of Industrial Arts for Phila-

(Continued on page 18A)

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(Continued from page 17A)

delphia, presented the members of the U. S. Office of Education Conference Committee on Industrial-Arts Education and paid a splendid tribute to Dr. Maris M. Proffitt, the chairman of that conference.

Professor Orville E. Sink of the Ball State Teachers College at Muncie, Ind., announced the names of those members of Epsilon Pi Tau who had been cited for the Laureate award. The list included Mr. Orville D. Adams, State Director of Vocational Education, Salem, Oreg.; Dr. William T. Bawden, State Teachers College, Pittsburg, Kans.; Mr. Fred M. Groshong, director of Industrial Arts, Portland, Oreg.; Professor C. Blair MacLean, State Teachers College, Fitchburg, Mass.; Mr. John J. Metz, editor of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Milwaukee, Wis.; Professor Irving C. Perkins, State Teachers College, Buffalo, N. Y.; and Mr. John J. Seidel, state director of Vocational Education, Baltimore, Md.

It was announced that Dr. Lawrence F. Ashley of the State Teachers College, Charleston, Ill., was made a member of the National Policies Board of the Fraternity to succeed Professor Elroy W. Bollinger of the New York State Department of Education, whose term of office expires on June 1.

Mr. Elmer W. Christy, director of Industrial Arts in the Cincinnati Public Schools presented the new U. S. Office of Education bulletin, entitled *Industrial Arts, Its Interpretation for American Schools*, and Professor R. Lee Hornbake of the State Teachers College at California, Pa., presented the new 92-page double-column publication of Epsilon Pi Tau. The four-page illustrated folder which the Fraternity published is a tribute to John Woodman Higgins, president of the Worcester Steel Corporation, Worcester, Mass.

Commissioner Butterfield of Connecticut then gave a splendid and entertaining address following which a number of men spoke including Mr. John A. Backus of the American Type Founders Sales Corporation; President Charles M. Herlihy of Fitchburg, Mass.; President Edward S. Maclin of Montgomery, W. Va.; Dr. Grover, superintendent of the Euclid, Ohio, schools; and Dean Harry Ganders of Syracuse University.

It was decided to hold the next annual meeting in Columbus, Ohio, some time in March, 1939.

Epsilon Pi Tau annual initiation and conference held at Atlantic City, N. J., in connection with the meeting of the American Association of School Administrators, February 28, March 1, and 2, 1938

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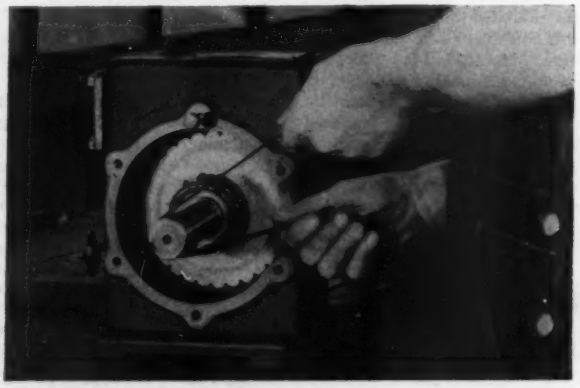

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A.V.A. CONVENTION REPORT

(Concluded from the February issue)

The industrial-arts section meeting on Thursday, December 2, had as its theme Industrial Arts in an Industrial Society. Elmer W. Christy, Director of Industrial Arts, Cincinnati Public Schools, Cincinnati, Ohio, was the chairman. Willis B. Anthony, Director, Practical Arts Department, State Teachers College, Fitchburg, Mass., spoke on Industrial Arts in the New England States. Maris M. Proffitt, Specialist in Industrial Education, Office of Education, Washington, D. C., presented an interpretation of industrial arts for American schools and William L. Hunter, Head of the Industrial-Arts Department at Iowa State College, Ames, Iowa, spoke on The Question of Industrial Arts and the Machine Age. The discussion leaders for these various presentations were Raymond W. Phipps, Chairman, Department of Industrial Arts, Teacher Education, Teachers College, New Britain, Conn.; Homer J. Smith, Professor of Industrial Education, University of Minnesota, Minneapolis, Minn.; and John Ludington, Professor of Industrial Arts, Ball State Teachers College, Muncie, Ind.

The Friday morning session of the Industrial-Arts Education Section had as its theme, Design in the Field of Industrial Arts. Leo L. Winslow, Director, Division of Art Education, Baltimore Department of Education, Baltimore, Md., was the chairman. Ivan Rigby, Art Teacher at the Forest Park High School, Baltimore, Md., spoke on Industrial Design Today, Elizabeth Shannon, Head of the Design Department, The Maryland Institute, Baltimore, Md., on The Adaptation of Design to Modern Needs, and Leon L. Winslow, on Good Taste in Industrial Arts.

The Friday afternoon session discussed Industrial Arts in the Secondary Schools. Frank C. Moore, Director of Industrial Arts, Board of Education, Cleveland, Ohio, was the chairman. E. Leroy Longley, Garrison Junior High School, Baltimore, Md., spoke on Teaching Metalwork in the Junior High School. He exhibited many samples of the work done by his students. O. E. Sink, Ball State Teachers College, Muncie, Ind., spoke on Industrial Arts in the Cosmopolitan High School. He emphasized that the use of power and increase of leisure makes it necessary for the teacher to emphasize many things that were not of so much importance in times past. He emphasized also that all girls and boys ought to be given a chance at industrial-arts work, so that they could give expression to a child's life in the schoolroom.

Roy G. Fales, Supervisor of Industrial Arts, State Department of Education, Albany, N. Y., spoke on The Trends of Industrial Arts in the Secondary Schools. He called attention to the changes that have developed in industrial-arts work since 1930. Not only has the work increased immensely but new concepts have been formed to adequately take care of social needs, the new environment, the need for consumer education, and the like. Charles F. Bauder, Director of Industrial Arts, Board of Education, Philadelphia, Pa., summarized the material that had been presented and led in the discussion.

The annual industrial-arts luncheon on Saturday was well attended. On this occasion Riley S. Williamson, Head of Technical Department, Baltimore City College, Baltimore, Md., was the chairman and George M. Gaither, Supervisor of Industrial Education, Baltimore, Md., the toastmaster. Charles F. Willis, Assistant Superintendent of Schools, Baltimore, Md., spoke on education in industrial arts and C. E. Partch, Dean of School of Education, Rutgers University, New Brunswick, N. J., on personal practice in the teaching profession.

The industrial-education group had a number of interesting sessions. The one Wednesday morning was a subsection meeting of the National Association of State Supervisors of Industrial Education. Herman S. Hall, State Supervisor, Trade and Industrial Education, Hartford, Conn., was the chairman and the address was given by Frank Cushman, Chief, Division of Industrial Education Service, U. S. Office of Education, Washington, D. C.

Wednesday afternoon the National Association of Teacher Trainers discussed research and the need for it at a joint luncheon which was a subsection meeting of the Industrial-Education Teacher Trainers with the National Association of State Supervisors of Industrial Education, under the chairmanship of Dr. George E. Myers, Professor of Vocational Education, University of Michigan, Ann Arbor, Mich. Dr. Lewis A. Wilson, Assistant State Commissioner, Vocational Education and Extension Education, Albany, N. Y., gave the address. The National Association of State Supervisors of Industrial Education had their meeting following this luncheon as did also the Industrial-Education Teacher Trainers. The latter group at their meeting, organized a national association under the name of National Industrial Teacher-Training Organization.

The Industrial and Part-Time Education group discussed in their Thursday afternoon meeting, the question of objectives and standards in industrial education. Russell J. Greenly, Professor of Trades and Industries, Purdue University, West Lafayette, Ind., was the chairman. Speakers on this occasion were Franklin J. Keller, Principal of the Metropolitan Vocational High School, New York, N. Y., who spoke on the

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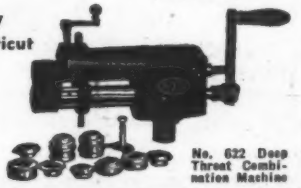

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administrative and supervisory problems involved in operating programs in education; Edwin E. Gunn, Assistant State Director of Vocational Education, Madison, Wis., discussed the promotion and development of apprentice trade; O. B. Badger, Director, Industrial and Adult Education, Tulsa Public Schools, Tulsa, Okla., standards in industrial education, and J. G. Spofford, Assistant for the Training of Teachers of Trades and Industries, State Department of Public Instruction, Trenton, N. J., the recruiting of men who are to be the future instructors in industrial education. H. A. Tiemann, State Director of Vocational Education, Denver, Colo., summarized the various speeches. Out of this meeting came the recommendation to appoint a committee which is to set objectives and standards for industrial education.

The rehabilitation meeting was held Friday morning. At this meeting R. M. Little, Director of Rehabilitation, State of New York, spoke on the man behind the handicap. Ralph P. Truitt, Executive Secretary, Maryland Mental Hygiene Society, discussed the emotional problem resulted from disabilities and Margaret L. Washington, District Supervisor of Rehabilitation, State of Tennessee, spoke on future rehabilitation through special education. Mark M. Walter, Director of Rehabilitation, State of Pennsylvania, was the discussion leader.

The vocational guidance group in their meeting, Thursday afternoon, had a panel discussion of which Edwin A. Lee, Director, National Occupational Conference, New York, N. Y., was the leader. The members of the panel being Frank W. Ballou, Superintendent of Schools, Washington, D. C.; Ben G. Graham, Superintendent of Schools, Pittsburgh, Pa.; Carroll R. Reed, Superintendent of Schools, Minneapolis, Minn.; David E. Weglein, Superintendent of Schools, Baltimore, Md.

Friday afternoon was also given over to a panel discussion at which Leona C. Buchwald, Supervisor, Guidance and Placement, Baltimore Public Schools, Baltimore, Md., and A. K. Getman, President, American Vocational Association, Inc., presided. Among members of the panel were the following: O. D. Adams, Director, State Board for Vocational Education, Salem, Oreg.; Charles R. Allen, Vocational Consultant, San Antonio, Texas; W. A. Bass, Executive Officer, State Board for Vocational Education, Nashville, Tenn.; Frank Cushman, Chief, Industrial Education Service, U. S. Office of Education, Washington, D. C.; George P. Hambrecht, State Director of Vocational Education, Madison, Wis., and Vice-President, American Vocational Association, Inc.; Herb Heilig, Director of Vocational Education, Newark, Dela.; Walter B. Jones, Chief, Industrial Education, Commonwealth of Pennsylvania, Department of Public Instruction, Harrisburg, Pa.; Leonard Miller, Director, Vocational Guidance, Rockland County, N. Y.; F. E. Moore, State Director of Vocational Education, Des Moines, Iowa; Irvin S. Noall, Supervisor of Occupational Education, Salt Lake City Public Schools, Salt Lake City, Utah; Morris E. Siegel, Director of Evening and Continuation Schools, New York City; Harry A. Tiemann, State Director of Vocational Education, Denver, Colo.

Both the Phi Delta Kappa fraternity and the Iota Lambda Sigma fraternity had their annual dinner meetings and banquet on Friday evening. There were very many other sectional meetings, one of the most interesting of which was that of the printing division held Saturday morning. Harold G. Crankshaw, President, The National Graphic Arts Education Guild, Central High School, Washington, D. C., was the chairman. Vernon P. Scheidt, Waverly Press, Baltimore, Md., spoke on the personnel selection for the trade. He pointed out that various employers use divers methods of selecting their help some of which were based on physical, racial, and chronological facts which played a part in the lives of the men whom they hired but which merely had nothing to do with their skill as printers.

Mr. Scheidt mentioned testing techniques which he and others had developed which were much more to the point and which furnished a scientific and rational approach to the problem of selecting the right kind of help. Wm. F. Patterson, Secretary, Federal Committee on Apprentice Training, Washington, D. C., gave an excellent presentation of what modern apprenticeship means to the trades. J. Henry Holloway, Principal, The New York School of Printing, New York City, spoke of the school in training for industry, while Glen U. Cleeton, Head of Department of Printing, Carnegie Institute of Technology, Pittsburgh, Pa., led in the discussion and gave an excellent résumé of what had been presented.

Unfortunately an error crept into the first part of the report which was published in the February issue of this magazine. It was there stated that J. W. Studebaker, Commissioner of Education, Washington, D. C., was not present to deliver his address at the banquet held on Thursday, December 2. As a matter of fact Mr. Studebaker was not only there but delivered an excellent address entitled, "Education for the 85." Although this address has already appeared in the *A.V.A. Journal and News Bulletin*, nevertheless, it is being reprinted in this issue of this magazine because of its value to all interested

(Continued on page 23A)

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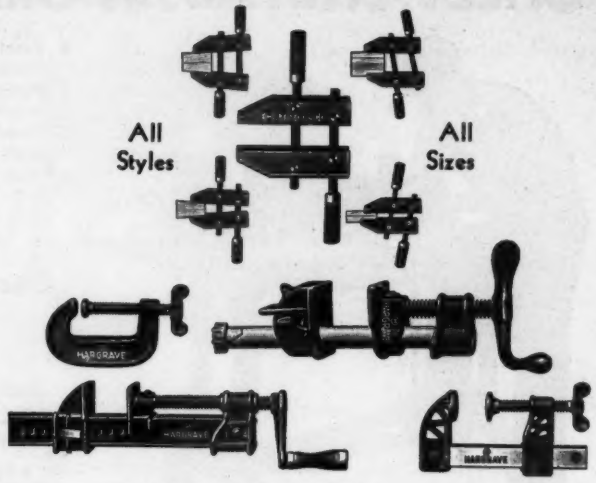

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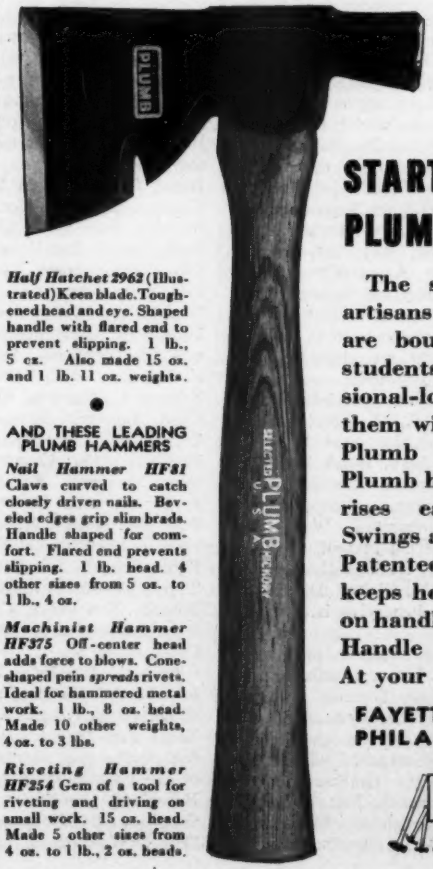

Half Hatchet 2962 (Illustrated) Keen blade. Toughened head and eye. Shaped handle with flared end to prevent slipping. 1 lb., 5 oz. Also made 15 oz. and 1 lb. 11 oz. weights.

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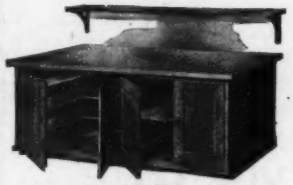
Glue and Stain Bench No. N-3154

Drawing Table No. BL-94

Metal Worker's Table No. N-3151

Ever-Hold Automatic Adjustable Chair No. B-1721

Ever-Hold Automatic Adjustable Stool No. E-1824

(Continued from page 21A)

in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

At the meeting of the House of Delegates which was held Friday, December 3, the usual reports were made. At this meeting a desk and chair were presented by the American Vocational Association to Charles W. Sylvester, Director of Vocational Education, Baltimore, Md., and Treasurer of the A.V.A., in recognition of the work which he has done for the association.

The officers elected for the coming year are: Thomas H. Quigley, Head of Industrial Education Department, Georgia School of Technology, Atlanta, Ga., president, and Charles W. Sylvester, treasurer. A. K. Getman, President of the State Department of Education, Albany, N. Y., was elected vice-president in charge of the vocational-guidance section and the vice-president for the industrial-education section, John J. Seidel, State Supervisor of Trade and Industrial Education, Baltimore, Md.

The next convention meeting will be held at St. Louis, Mo.

News Notes

¶ The Department of Publishing and Printing of the Rochester Athenaeum and Mechanics Institute, Rochester, N. Y., will add approximately 2,500 square feet of floor space to the laboratory this month. The area will house the press and bindery departments to which is added a Challenge paper drill, Diamond 36½-in. power paper cutter, model 00 Cleveland folder, and a battery of Chandler & Price platen presses. The equipment supplements the Rice 12 by 18 press, Miehle vertical and horizontal, and Kelly No. 1.

Harry L. Gage, Vice-President of the Mergenthaler Linotype Company, will speak at the lecture series on "Research of the Graphic Arts." The meeting will be held Tuesday evening, April 12.

Great interest is shown by Rochester printers in the evening courses offered this term. Thirty-four individual firms are represented in the student body of 77. Courses now offered and the number enrolled in each are: Commercial layout, 15; hand composition, 15; linotype and intertype operation, 14; cylinder presswork, 22; linotype and intertype maintenance, 11. Courses in monotype operation are now open to students. Six instructors are employed under the direction of R. Randolph Karch, Technical Supervisor.

¶ The Pratt Institute School of Fine Arts, at Brooklyn, N. Y., has announced that a degree of bachelor of fine arts in art education will be given to students who satisfactorily complete the four-year course in teacher training in art education. The degree will be granted beginning with June, 1938, and annually thereafter. Former graduates who desire to qualify for the degree are urged to communicate with Mr. Vincent A. Roy, supervisor of the teacher-training department, who will explain to them the admission requirements.

The Division of Higher Education, Albany, N. Y., has approved the revised program, and the Division of Teacher Education and Certification of the University of the State of New York has taken the same action.

¶ The Kansas State Board of Education has co-operated with the Kansas State Teachers' College, Pittsburg, in conducting a short, intensive course for electrical inspectors for the rural electrification program. A group of sixteen men is spending two weeks in Pittsburg attending afternoon and evening classes under the direction of Prof. W. H. Matthews.

¶ The Technical High School, in Dallas, Tex., has added a number of new departments. The part-time apprenticeship training program is progressing. Training is being offered in storage-battery manufacture, garment cleaning, casket making, clock repair, and photo-engraving. It is planned to enlarge the program to include trade industrial, technical, and commercial work, with a co-ordinator in charge of each.

The board has purchased a property near the school with a plant formerly used as a garage and battery repair station. The building has been remodeled and will be used as a school automobile shop.

¶ "Standards of School Lighting" is the title of a new revised booklet on school lighting, prepared by the Illuminating Engineering Society, and the American Institute of Architects, and approved by the American Standards Association. The new edition replaces the standards of 1932 and is a comprehensive study of the subject.

¶ The National Society for the Prevention of Blindness has announced a new booklet, "Eye Hazards in Industrial Occupations," by Louis Resnick and Lewis H. Carris. This booklet is a safety handbook for engineers, inspectors, safety men, industrial physicians, and nurses, and those responsible for industrial operations. It contains 249 pages and sells for fifty cents.

¶ The National Society for the Prevention of Blindness has announced college credit courses for the training of teachers and supervisors of sight-saving classes, to be offered during the 1938 summer sessions at Tulane University, New Orleans, La.; University of Cincinnati, Cincinnati,

(Continued on page 24A)

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Adjustable Steel Handle—Stop in Front Jaw
Wood Handle Furnished if Desired. Furnished with or without stop in front jaw. Faces drilled for installation of wood faces

Vise No.	*Width of Jaw, Inches*
210A	7
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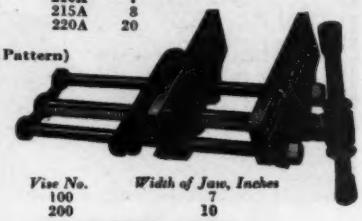
QUICK ACTION VISE (Toles Pattern)

Has unusually effective and durable working action. Screw is 1¼" in diameter. Half nut of high quality bronze whit accurately cut threads. Furnished with or without dogs in front jaw.



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100	7
200	10

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Unsurpassed for strength and durability

Swivel Base Machinist's Vise

Stationary Base		Swivel Base	
Vise No.	*Width of Jaws Inches*	*Vise No.*	*Width of Jaws Inches*
30	3	130	3
35	3½	135	3½
40	4	140	4
45	4½	145	4½
50	5	150	5

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(Continued from page 23A)

Ohio; University of Washington, Seattle; Wayne University, Detroit, Mich.; State Teachers' College, Buffalo, N. Y.; Teachers College, Columbia University, New York, N. Y.

¶ The public schools of Memphis, Tenn., have recently come into possession of a bequest of $1,250,000, through the will of the late William R. Moore. Under the will, the money is to be used for the erection of the Moore School of Technology, to furnish training of a vocational or trade character to boys and young men of the community.

The terms of the will are being carried out this year. A site has been purchased and plans have been completed for a trade-school building, to be erected at a cost of $200,000. Construction work was started in May and the school will be completed and occupied in September.

New Products

¶ The new type SW steel-wooling machine, just placed on the market by the Porter-Cable Machine Company, Syracuse, N. Y., has been produced in response to a demand for a machine which can perform a job of cleaning and polishing quickly and easily.

This new type SW machine provides an efficient machine for both steel wooling and polishing floors quickly and smoothly. It operates with the grain, preventing circular scratches; it is economical in use because it contains four pounds of steel wool tightly wound on a cardboard drum by an exclusive method; it has a powerful vacuum drum which picks up all the dust and particles of steel wool, keeping them out of the air and off of the floor; a tilting device permits pressure control on either steel-wooling or polishing operation. It is easy to

change the steel-wool cylinders, or to change from the steel-wool cylinder to the polishing brushes. An unconditional guarantee for all time, accompanies the machine.

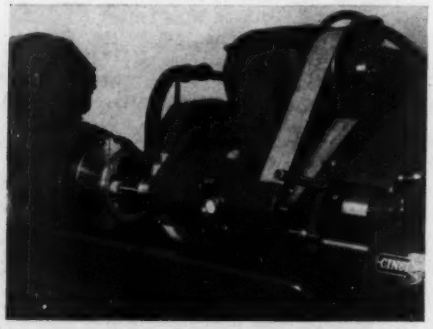
The machine is useful on maintenance work, where wood, linoleum, cork, rubber, or tile must be cleaned, either over large areas, or in spots, where traffic is heavy.

Complete information will be furnished upon request.

¶ The new internal grinding attachment, recently developed by the Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio, adds materially to the versatility, rapidity, and the making of accurate setups for the Cincinnati 12-in. and 16-in. Universal grinding machines.

This attachment which has been permanently fixed to the machine, is hinged at the front of the grinding-wheel head. It is useful for a wide variety of grinding operations.

The hinged internal attachment may be rigidly mounted for substantial stock removal and is useful where a considerable amount of internal work must be handled. By merely swinging the



Hinged Type Internal Grinding Attachment

spindle housing down and tightening one bolt, it is placed in accurate alignment for straight, external, and internal grinding. The attachment also permits both operations to be performed without removing the work from the chuck.

The attachment is driven by an individual motor; a single-hinged bolt clamps it firmly to

(Continued on page 26A)

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Short units are offered by national leaders in Administration of Vocational and Adult Education, Supervision of Vocational and Adult Education, Family Life, Conference Leadership, Safety Education, Apprentice Training, Consumer Education, Problems in Curriculum Construction, and Distributive Occupations.

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The Stout Institute summer session offers graduate curricula leading to the Master of Science Degree in Industrial Education or Home Economics, and undergraduate curricula leading to the Bachelor of Science Degree in these fields.

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DIRECTOR OF SUMMER SESSION
The Stout Institute Menomonie, Wisconsin

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Summer Session—June 20 to July 29, Second Session—August 1 - Sept 2.

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The student may plan a program which will lead through successive summers to the bachelor's or master's degree. Approved programs carrying the recommendation of Oregon State College are accepted by all state departments of education for either *Special* or *General Secondary* Credential. See the half-page advertisement in the March issue of Industrial Arts and Vocational Education for a full list of courses available in the Industrial Education program. Correspondence invited.

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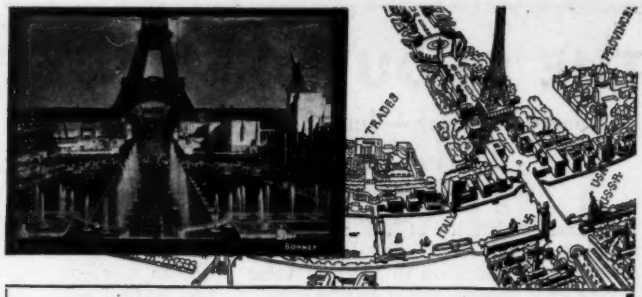

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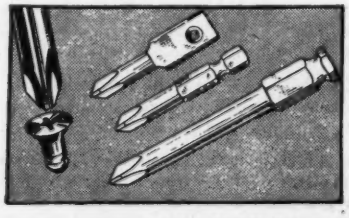
Write for further information

McGRAW-HILL BOOK COMPANY, Inc.
330 West 42nd Street New York, N. Y.

(Continued from page 24A)

a machined pad in front of the wheel-head casting; an endless flat belt drives the attachment spindle; a heavy tension spring holds the attachment in its up position; any one of seven different spindles may be specified, since the speeds depend upon the spindle chosen; the spindle bearings are antifriction and adequately lubricated. The firm has prepared a complete descriptive circular which it will send to any school-shop instructor upon request.

¶ Stanley Tools, New Britain, Conn., has announced a complete line of power bits, ranging in size and design to cover the entire range of Phillips screws and for use with all types of electric, air, and spiral screw drivers. The Stanley power bits are made of high-quality alloy steel, tempered and hardened to give the ultimate in strength and long wearing qualities.



In addition to power bits, the Stanley Company also offers a variety of hand screw drivers and bits for braces to fit all sizes of Phillips screws.

The firm has prepared a special descriptive folder, illustrating these tools, which will be sent to any school-shop instructor upon request.

¶ The new Oliver No. 232–D tilting arbor saw bench, just placed on the market by the Oliver Machinery Company, Grand Rapids, Mich., is complete in all of its appointments and modern in appearance.

The No. 232–D tilting arbor saw bench is equipped with a permanently level table which keeps the work in proper position at all times. It is provided with the antikick back catch, assuring maximum safety, and is simple in construction, dependable, accurate, and convenient.

Its advantages may be summarized as follows:

1. Saw tilts, table always horizontal—greater capacity, more efficiency, greater safety.
2. Heavy, rigid base—perfect alignment.
3. Three point bearing on floor—assures permanent alignment.
4. Large swing segments—easy tilting of saw.
5. Ball bearings—less friction—longer life.
6. Sawdust outlet built in—operates with or without exhaust.
7. Completely wired—ready for use.
8. Perfectly guarded—greatest safety assured.

The machine is well suited for the industrial-arts shop and vocational school. Complete information will be furnished to any shop instructor upon request.

¶ The Armstrong Brothers Tool Company, Chicago, Ill., has announced a new and complete line of wrenches for hollow screws. Instead of wrenches formed from lengths of hexagonal bar stock, the hollow-screw user can now assemble a tool of size, shape, and length needed from a set of interlocking drivers, handles, extensions, and ratchets.

The Armstrong hollow-screw wrench resembles in general a detachable head of a socket wrench. In place of a socket to fit over a screw head, there is a protruding hexagonal driver which fits into the hollow screw. The wrenches, handles, and extensions are made of chrome-vanadian tool steel. The reversible ratchets are drop-forged with hardened-steel gears, and all wrenches and parts are chrome plated.

Complete information is furnished upon request.

Trade News

¶ The popularity of the Eldorado-Scholastic Freehand Drawing Contest among high-school students has encouraged the Dixon Company,

(Continued on page 29A)

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METAL CRAFTS SUPPLY CO.
37 Aborn St., Providence, R. I.

(Continued from page 26A)

makers of Eldorado Pencils, to offer a new group of awards for mechanical drawing.

The Eldorado Mechanical Drawing Awards are offered annually and are planned along the same lines as the Eldorado Freehand Drawing prizes. A number of cash prizes are offered for students and a handsome bronze plaque for the school submitting the best group of projects.

Two projects were submitted to the students. The first called for a design of a soapbox derby racer, and the second required a plan for an ideal summer camping cabin.

The contest was promoted intensively, and both faculty and students were informed about it through a series of advertisements and prepared literature. A number of special educational publications were used to inform instructors about the contest and to familiarize them with its aims.

¶ Bermingham & Prosser Company, Chicago, Ill., has recently perfected a special block printing paper called Textone. This comes in a gray color, and can be obtained in small or large sheets, also in rolls.

¶ Mr. Carl Parsons has been appointed educational representative in the eastern states for the American Type Founders, Elizabeth, N. J. Mr. Parsons' varied experience in school and allied lines will enable him to be of valuable assistance to school officials. He has spent several years in schoolwork as teacher, principal, and superintendent. Since 1927, he has represented a number of the leading educational publishing companies in New England.

¶ Mr. Dean H. Schwarz, whose sudden death occurred recently, was well known in the eastern school field because of his work as salesman and branch manager of the Eugene Dietzgen Company. Mr. Schwarz died suddenly following a heart attack while driving from Philadelphia to his home in Pelham, N. Y. He was 40 years old.

Although young in years, Mr. Schwarz was a veteran to the trade, having been with the Dietzgen Company for the past twenty years. He entered the employ of the firm shortly after his graduation from State College in Lock Haven, Pa. At his death, he was serving the company in the dual capacity of assistant sales manager and manager of the Philadelphia office.

Mr. Schwarz is survived by his wife, and a 12-year-old son.

New Trade Catalogs

¶ The Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio, has issued its new Catalog No. G–410, illustrating and describing its line of 6-in. and 10-in. plain hydraulic grinding machines, which have the features of versatility, compactness, and convenience. These machines are convenient, easy to manipulate, quick to install, and the repair cost is reduced to a new low level. Of special importance are the rapid production and minimum physical fatigue through the use of a new hydraulic feed device, supplied as standard equipment.

The machines have special electrical control equipment for better protection of the contacts; a hinged cover on the left hand protects a compact group of magnetic starters. A time-saving feature is the automatic and simultaneous action of several separate functions, controlled by one movement of the hands. The table may be stopped or started automatically and the work may be advanced or withdrawn at the demand of the operator.

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For Industrial Arts

Instructors praise the versatility and smooth performance of this safe, efficient, modern tool. Students are delighted with the many interesting jobs they can do with the Handee. Actually, a *Whole Shop Full of Tools in One.* Uses 200 different accessories for work on all metals, alloys, resins, wood, etc. Plugs in any electric socket. AC or DC—110 volts.

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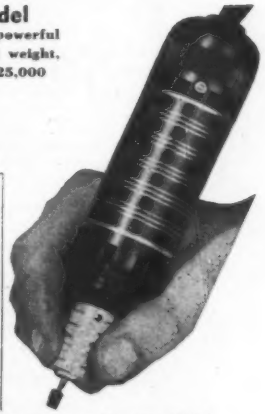

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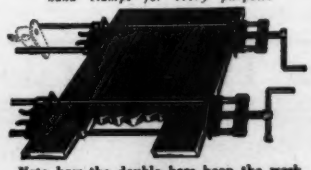

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HARTFORD CLAMP CO.
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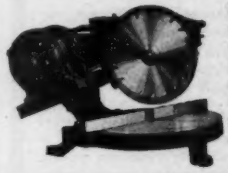
Precision Tool of a Thousand Uses



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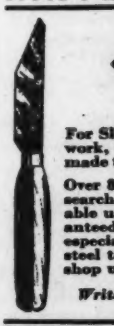

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